ENGINEERING CONSTRUCTION WEEKLY

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Engineering NEWS-RECORD

September 30. 1937

Public Works Number

A presentation of notable current municipal activity and of advance thinking on urban questions that is addressed to those engineers and administrators who are confronted with the problems involved in building better cities

New York's Newest Sewage Plant

Streets of Tomorrow

Municipal Finance

City Bus Terminal Design

Engineers as Town Planners

What Zoning Has Done

Drafting Land Descriptions

Automatic Water Valve Control

Including also a number of short articles relating to electric control equipment, refuse collection, water control and distribution, and regional planning

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1937

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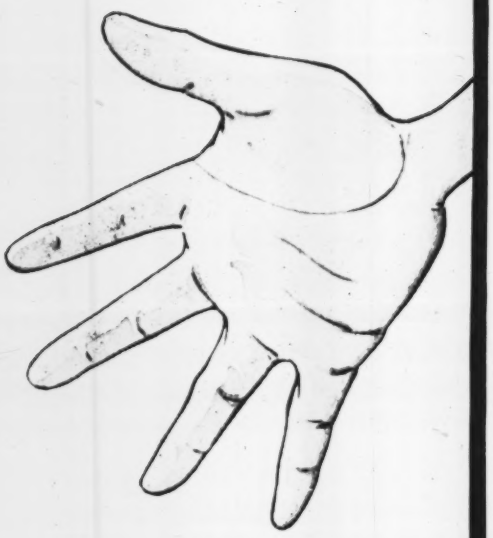
V-3



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Journey's End

DURING RECENT WEEKS Harold Denny, Moscow correspondent of the New York Times, has presented in that newspaper a series of articles describing current conditions in Russia. He is on leave in Paris, so these articles appear without benefit of censorship. The concluding article contains the following significant paragraphs:

"Basically, Russia's ills may be attributed to the principles according to which the Soviet régime is attempting to shape her development. The most important of these ills are: first *the low production, bad quality, chaotic distribution and high prices of nearly everything it makes and the low wages it pays ordinary labor for making them;* secondly, the lack of intellectual liberty and freedom of expression or even assurance against unjustified arrest; and thirdly, *constant application of police power in attempts to improve the operation of the economic machine* and the hunt for heretics.

"IN ENDEAVORING TO PLACE all production and distribution, including the most trivial consumer goods, in the hands of the State, so as to wipe out the exploitation of the workers by capitalists according to the Marxian principles, the Soviet régime seems to have bitten off more than it can chew. The men who are now running Russia are capable and practical, but *it would seem that a group of men competent to conduct the entire economy of a vast country as one unit could not be assembled from the whole world.* It would seem also that *the most overwhelming police power is not so effective in producing an adequate supply of good goods as old-fashioned bourgeois competition,* which the Soviet tries with scant success to match with 'Socialist competition.'

"Soviet industry functions well at points where real competition enters. Such points include production of airplanes and military equipment. In these the Soviet is in what might turn out to be life-and-death competition with the outside world. Her planes, tanks and guns must be good; therefore they are good. *In consumer goods there is little at stake. The Soviet Union will not totter if the Soviet shoes for which Ivan Ivanovich pays half a month's salary soon go to pieces, if matches will not light or if stores carry electric fans and bathing suits in the Winter and electric heaters and ski-suits in the Summer.*

"Furthermore, the stamping out of all private manufacturing enterprise necessitates the application of police power to a large part of the population, because it stifles age-old individualistic instincts. There must be constant watch lest some little entrepreneur establish a hole-in-the-wall factory or endeavor to make a profit by cornering wanted products and peddling them.

"Even closer supervision of the people's thinking is required under this system. Communism is a body of dogma that has been subjected to changing interpretations, like the dogma in the formative periods of the Christian religion. *Infidelity and heresy are the blackest of all crimes because they threaten the very foundation of the State.* Therefore, they must be hunted down mercilessly. And that requires an army of spies, both paid and voluntary.

"WITH THE ENTIRE ECONOMY being conducted like one great plant and with an error of judgment likely to be construed into 'Trotskyist sabotage', there is a setting for a tremendous bureaucracy, both of clerks to attend to the mountains of paper work piled up by executives dodging responsibility for safety's sake and of Communist party functionaries and trade-union personnel, who add parasitic costs to production. *The Soviet worker must carry these on his own back.*"

All italics are by this writer. The phrases thus indicated are commended especially to those who view with complacency the trend toward a "planned economy" in our own country. It is not necessary for us to go whole hog for Soviet Communism in order to feel some of the effects here described by Mr. Denny. The moment we embark in any degree on federal control of productive enterprise we set in motion the same forces that now dominate the Russian economy; it is simply a matter of how far we may be led along that road. So, before we start, it may be just as well to ponder this glimpse of "Journey's End."

Willard Chevalier

ENGINEERING NEWS-RECORD

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VOL. 119 *SEPTEMBER 30, 1937* NO. 14

THIS WEEK AND NEXT

MANY PHASES of municipal engineering activity are highlighted in this issue which opens with a description of New York's newest sewage disposal plant at Tallmans Island. The design features of this activated sludge installation have not been made public before.

For those concerned with traffic problems the article on "Streets of Tomorrow" will offer some sound ideas that some day may find wide acceptance in congested centers.

City planners will also be interested in a searching analysis of zoning practice, which reveals why it works in some places but fails in others.

Something new in municipal enterprise is the construction and operation of a union bus terminal. For complete details read the story of what recently took place in progressive Hackensack, N. J.

If 1936 was the "platinum era" in municipal finance, what is 1937? According to Frederick L. Bird of Dun & Bradstreet, Inc., whose remarks are quoted on p. 557, this is the time to make some major changes in fiscal policy. He tells why and how.

It appears that "butchers, bakers and candlestick makers" have all had a hand in drafting land descriptions. This may be profitable for lawyers, but not for land surveyors; don't overlook the article on this.

And by the way, is your town proud of the quality of its water supply? The Texas state health department rating scheme, described on p. 559, encourages this type of local pride.

LACK OF SPACE, not merit, prevents the listing of other municipal articles on refuse collection, waterworks, paving, regional planning and electric control equipment.

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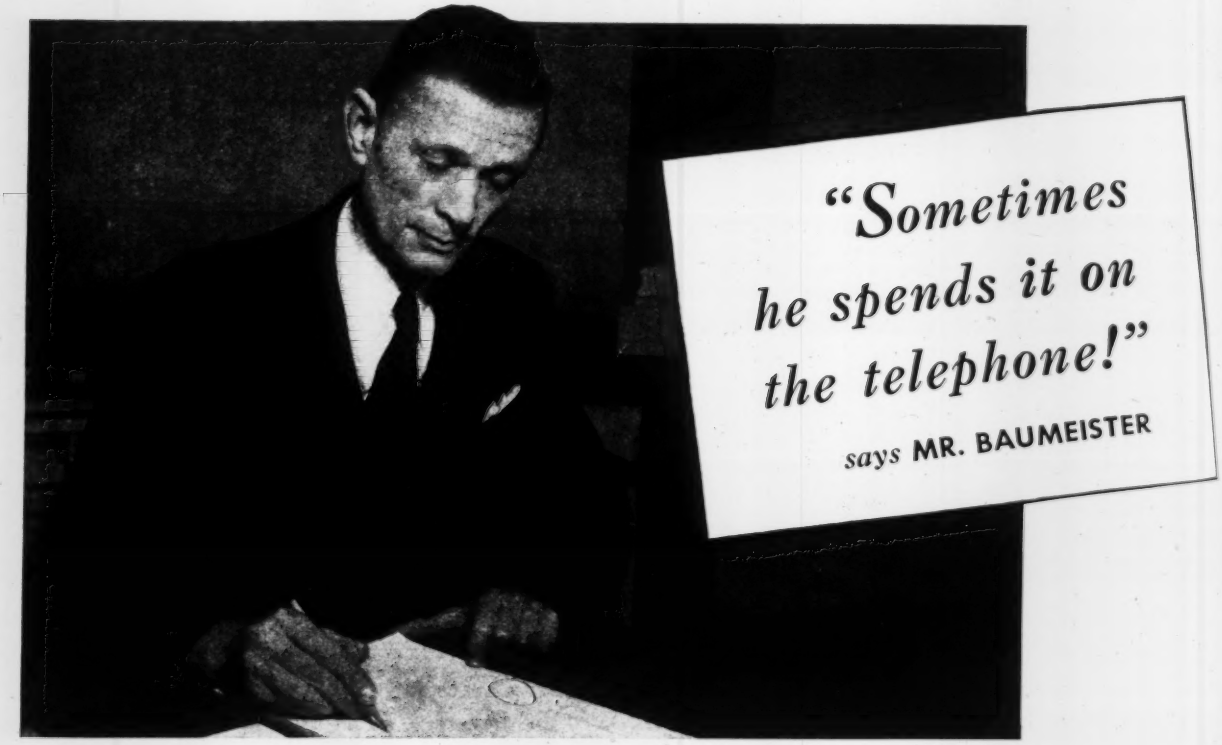
What does a chief order clerk do on Sunday afternoons?



PAUL C. Baumeister, Chief Order Clerk, has put through orders for nearly 670 million sacks of cement. This is enough cement to fill 800,000 railroad cars making a train 6,000 miles long, or equivalent to two solid trains of cement reaching from New York to San Francisco.

In cases of emergency, Mr. Baumeister is sometimes called upon to perform acts of special service for customers. Here's one example:

At 4 P. M. one Sunday afternoon the phone in the Baumeister home jingled. A salesman was on the line asking for delivery of three cars of cement the following morning so that an important paving job could be finished before cold weather set in. The loading department of the plant was shut down. No loaders were on hand. There were no cars placed for loading. No locomotives for moving the cars were available. It seemed an impossible job.

But Baumeister took it in stride. He got on the phone, stayed there until 2:30 Monday morning. He phoned the packing superintendent who got his packers from their homes at overtime pay to load the cars. He arranged with a belt line railroad to move the cars when loaded to a main line junction point. He arranged with the main line railroad to pick them up. This was done. At 6:00 A. M. Monday morning the cars were on the customer's siding ready for use.

Baumeister made 21 phone calls and worked over 10 hours to turn the trick. But everybody was happy—particularly the customer.

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THE WEEK'S EVENTS

Water Works Meet Draws 557

Large attendance at Poland Springs meeting of New England Water Works Association

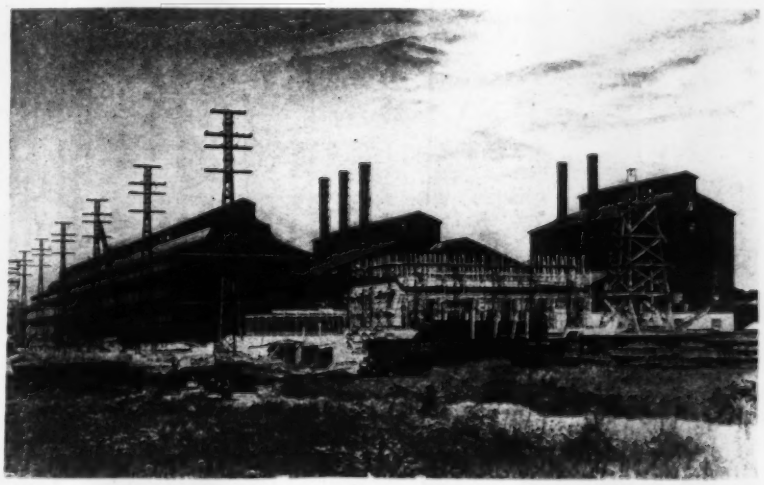
Featured by technical sessions on corrosion control and experience with gravel-packed wells, the 56th Annual Convention of the New England Water Works Association, at Poland Springs, Maine, September 21-24, attracted 557 members and guests. Manufacturers' exhibits totalled 53.

New officers elected were: Warren J. Scott, Hartford, Conn., president, who succeeds Harry U. Fuller of Portland, Me.; Percy A. Shaw, vice-president, and Harold L. Brigham, director. Leland J. Carleton and Frank J. Gifford, remain as treasurer and secretary.

George C. Bunker, consulting engineer, Caracas, Venezuela, was awarded the Dexter Brackett Memorial Medal, annual presentation for the outstanding paper published in the association *Journal* during the preceding year. Mr. Bunker's paper dealt with water supply problems in the tropics of South America.

In the symposium on corrosion control, lead by Dr. Frank N. Speller, director of metallurgy and research, National Tube Company, Pittsburgh, it was stated that protective measures

(*Continued on page 534*)



STEEL MILL CAPACITY EXPANDS

NEW HOT MILL now under construction at the Maryland plant of the Bethlehem Steel Co., at Sparrows Point, Md., is scheduled for operation in November. The enlargement program at the Maryland plant, which is part of the $75,000,000 building program begun by Bethlehem in 1935, will, when completed, provide for a total ingot production capacity of 2,517,000 tons annually. New construction includes two new units for the cold reduction of tin plate with an annual capacity of 270,000 tons, a new continuous 54-in. hot strip mill of 780,000 tons annual capacity, and a high speed rod and bar mill with an annual capacity of 240,000 tons. The rod and bar mill is also expected to go into operation in November.

The hot mill, now approaching completion, is shown above. The mill building proper is at the left, flanked by the furnace section to the right. The steam plant that serves the hot mill is shown at the extreme right in the foreground, and the foundation and partially completed first floor of a division office building appears in the center foreground.

Fresh water for processing and other requirements at the plant is to be provided by artesian wells on which drilling operations are now under way.

Last Allotments Made On PWA Program

With money still available President announces no more allotments will be made

With the approval of ten PWA allotments totalling $490,764 in grants and $89,000 in loans, President Roosevelt on September 21 indicated that the end has been reached to the program of allotments for non-federal projects that resulted from Congressional extension of the Public Works Administration. While the amount of funds available is by no means exhausted, the White House stated that "there has been a decreasing need for this stimulation with the passing of the economic extremity," and that no further allotments will be approved for the time being.

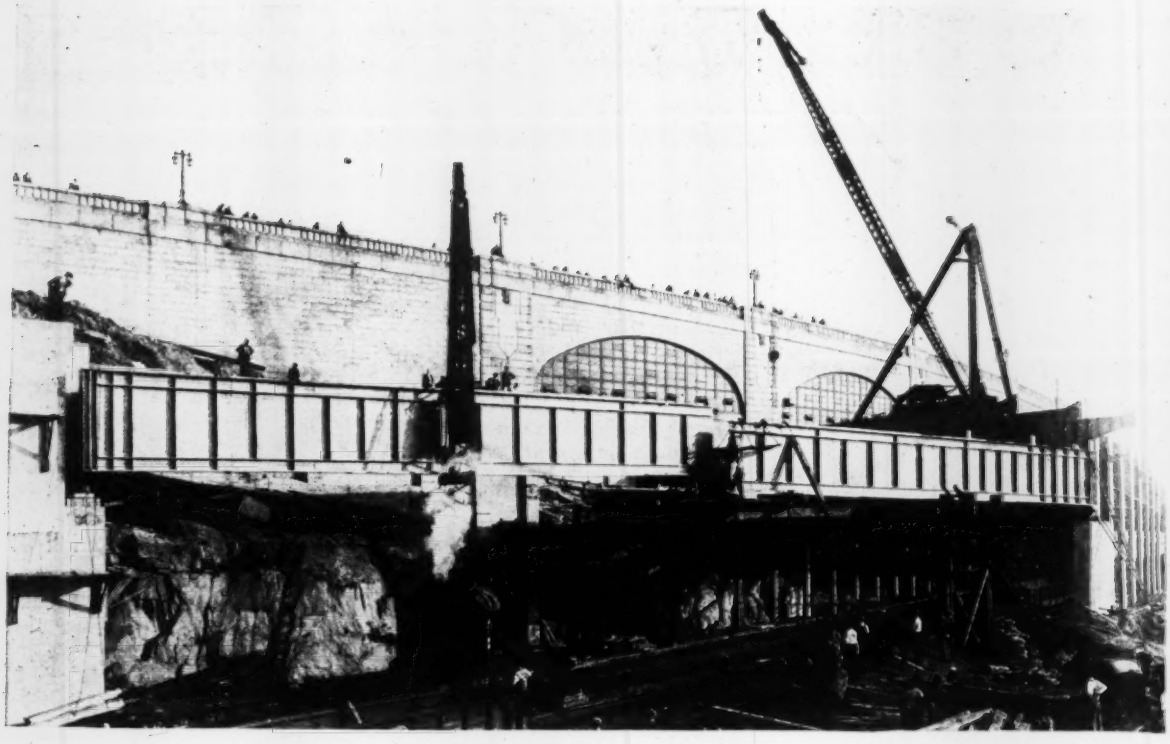
The 1937 program

Since the passage of the 1937 relief bill, which extended the life of the agency for two years, approval has been given to 1,253 allotments totalling $113,035,000 in grants and $58,006,000 in loans. Almost all of these projects fell in two categories: the replacement of unsafe school buildings, and undertakings that were delayed by the necessity of enabling legislation or bond elections, or both. Despite the fact that PWA has on file a large number of additional applications for funds, the President ruled that further allotments will be withheld because of the necessity for curtailing federal expenditures and also because the improved financial status of many municipalities leaves them well able to finance the work themselves. The PWA revolving fund now contains $254,612,000; this will revert to the Treasury, if not spent.

Ten thousand projects

Allotments have been made under the various PWA programs since that agency was initiated in 1933, for 10,605 non-federal public works projects costing $2,759,173,000.

On the 7,845 projects which have been completed, at a cost of $1,208,540,000, manhours totaling 661,089,000 have been created in direct labor at the site.



LONG GIRDER CARRIES HIGHWAY OVER 5-TRACK RAILROAD

WHAT IS BELIEVED to be the longest simple girder ever built in this country has just been set in place as part of the Riverside Park improvement work being carried out by the New York City Park Department and the New York Central R. R. (*ENR*, June 10, p. 863). At the point here shown the new express highway being built through the park crosses the railroad's 5-track line at a very flat angle necessitating a long span to avoid obstructions between the tracks. The girder is 188 ft. long between pins and about 11 ft. deep. It weighs 152 tons. The forces of the American Bridge Co. and the railroad cooperated in the erection. Bottom cover plates for the center of the girder were assembled on falsework spanning the tracks and the right half was set by the crane and derrick. Subsequently the crane alone swung the 70-ton left half into place. The structure was designed by the engineering department of the railroad. Madigan-Hyland are engineers for the Park Department.

Competition Is Announced For Elevated Highways

To foster designs for elevated vehicular highways that will better conform to the architectural requirements of city streets, the American Institute of Steel Construction has announced a national design competition. The plan, disclosed by Clyde G. Conley, president of the Institute, at a dinner in New York on Sept. 21, provides for a first prize of $5,000, a second prize of $2,000, a third prize of $1,000, and ten prizes of $100 each. The competition will close March 31, 1938, after which a jury, consisting of Harland Bartholomew, city planning consultant, St. Louis; Willard T. Chevalier, vice-president, McGraw-Hill Publishing Co., New York; Paul P. Cret, architect, Philadelphia; Loran D. Gayton, city engineer, Chicago; Paul G. Hoffman, president, Studebaker Corp.; Albert Kahn, architect, Detroit; and C. M. Pinckney, chief engineer of public works, Manhattan, New York City, will choose the prize winning designs.

Mr. Conley in his address pointed out that motor traffic in congested districts moves no faster than the horse-drawn traffic of 20 years ago and that most accidents in cities involve pedestrians.

Details of the competition are available from the American Institute of Steel Construction, 200 Madison Ave., New York. Among the design provisions are an H 20 loading; two 11-ft. lanes in each direction, physically separated; location over an existing thoroughfare; and 15 ft. underclearance over cross streets. Structural members are to be of steel although other parts may be of any suitable material. The committee of the Institute responsible for the competition consists of R. C. Mahon, president, R. C. Mahon Co., Detroit; Albert Reichmann, vice-president, American Bridge Co., Chicago, and C. M. Denise, general manager of sales, fabricated steel construction, Bethlehem Steel Co., Bethlehem, Pa.

War Department Gives Up Bedloe Island

Jurisdiction over the entire area of Bedloe Island in New York harbor, site of the Statue of Liberty, has been transferred from the War Department to the Department of the Interior. The garrison now housed at Fort Wood on the island will be moved to Fort Hamilton, Brooklyn, N. Y.

Previously the Department of the Interior had jurisdiction, through the National Park Service, over only the 2½ acres actually occupied by the Statue of Liberty, while the War Department controlled the rest of the area. A master plan for the development of the entire 12-acre island is now being prepared by the park service.

The Statue of Liberty came under the jurisdiction of the Interior Department in 1933, when it was transferred with other national monuments to the National Park Service.

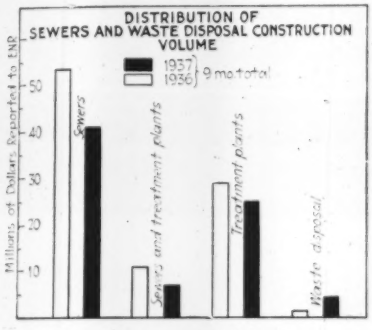
THE CURRENT TREND

This week's news of contract volume and construction cost factors

Sewage Disposal Awaits Financing

In spite of lag this year's volume should exceed $100,000,000

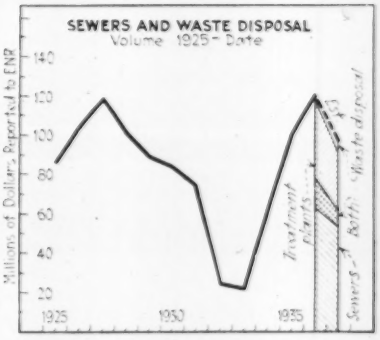
Sewage disposal financing is in a transition period. PWA grants have been inactive for a year, and many communities are holding back on their disposal programs to see what form federal aid may take when Congress reconciles the Barkley and Vinson bills which propose to deal with stream pollution by giving financial aid to local communities for sewage treatment.

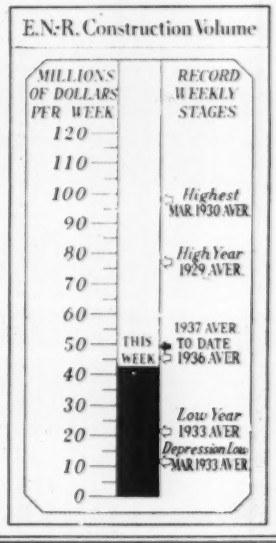


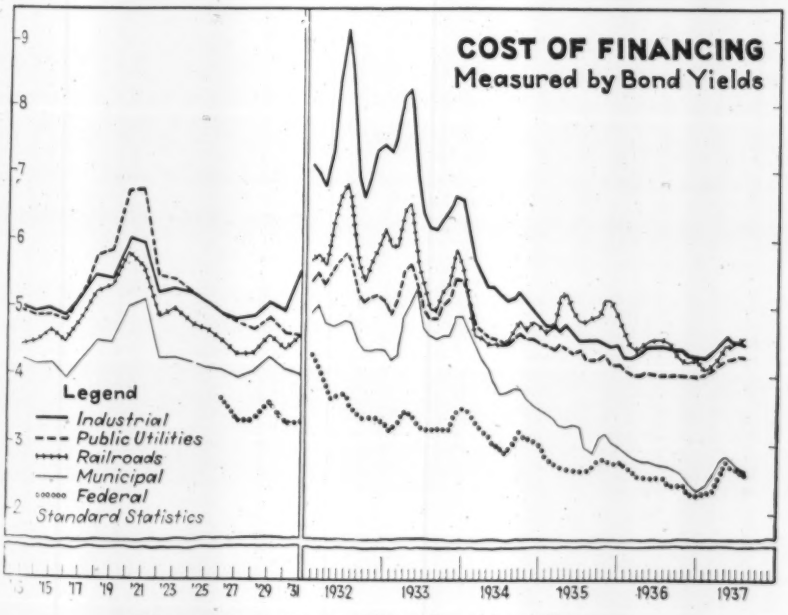
In spite of this dual retarding influence on sewage disposal the volume of construction this year should reach or exceed $100,000,000 compared with last year's all time high volume of $121,000,000.

Various studies have indicated the magnitude of the sewage disposal need. PWA's public works inventory of 1935 recorded it at 6,537 projects, sewers and treatment, at an estimated cost of $947,000,000. The National Resources Board estimated that $140,000,000 would give partial treatment for the 1930 population served in 1935 by sanitary sewers but no treatment plants and $380,000,000 would supply complete treatment to all sewered communities. The *Engineering News-Record* Sewage Disposal Inventory, 1935, showed in round numbers that 5,700 communities were served by sewers and 3,500 communities by treatment plants. At this time there were approximately 11,000 public water supplies in the United States. Thus more than 5,000 eligible communities are not served by sewer systems.

The 1937 sewage and waste disposal construction dollar, as reported by *Engineering News-Record*, has 53 c. for sewers compared with 52 c. last year, 33 c. for treatment plants compared with 35 c. last year, 8 c. for combined sewers and treatment compared with 12 c. a year ago, and 6 c. for garbage and waste disposal compared with 1 c. last year.







Financing Costs Recede After Upturn

Cost to municipalities, utilities and industrial companies of borrowing for construction began in January to climb out of the lowest rates on record in the past 25 years. This climb proceeded through May, turned back in June and has continued to recede. Current rates favor new construction financing.

THIS WEEK'S FIGURES

(Thousands of Dollars)

CONTRACTS

	Week Ending Oct. 1 1936	Sept. 23 1937	Sept. 30 1937
Federal	$6,260	$2,138	$7,591
State & Municipal	31,426	23,756	15,461
Total public	$37,686	$25,894	$23,052
Total private	19,384	16,283	19,442
TOTALS	$57,070	$42,177	$42,494
Cumulative 1937 (39 weeks)			$1,886,008
Cumulative 1936 (40 weeks)			$1,794,729

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1936 40 Wks.	1937 39 Wks.
NON-FEDERAL	$707,283	$1,268,682
State & mun. bonds	387,292	404,670
Corporate securities	203,969	455,947
PWA loans, grants	91,084	178,126
RFC loans	24,998	29,939
Fed. aid for highways		200,000
FEDERAL	$691,237	$746,223
TOTAL CAPITAL	$1,398,520	$2,014,905

Foundation of Earth Dam Fails

All indications point to foundation weakness as cause of failure of Marshall Creek Dam in Kansas

Engineering News-Record Staff Report

INSPECTION of the Marshall Creek Dam failure (*ENR*, Sept. 23, p. 495) serves but to confirm the conclusion, drawn from the early reports of the accident, that the cause of the great slump in the downstream side of the dam was failure of the foundation material to support the weight placed upon it.

As reported last week a section of the central part of the dam about 700 ft. long slumped on the night of Sept. 19 when the earth and rockfill structure was within 10 ft. of its full 90-ft. height. There was almost no water behind the dam. Beginning on a line parallel and close to the upstream edge of the embankment, the downstream part of the embankment dropped 40 to 50 ft. and moved downstream nearly 60 ft. leaving an almost vertical face. A few cracks opened up in the upstream slope of the dam, one being 4 in. wide.

The dam was planned to impound a lake of 330 acres as the central feature of a recreational park for Wyandotte County on the outskirts of Kansas City; dam and park were being built by the WPA, which had allotted $1,200,000 for the undertaking.

Plans and specifications were prepared by Wyandotte County, the sponsor and construction proceeded under the usual sponsor supervision. LeRoy Arnold is county engineer and E. I. Myers of Kansas City acted as consulting engineer on the project.

Responsibility for selection of the site and approval of the foundation is not clearcut. Mr. Arnold is understood to have favored another site, and soon after the work had started, Howard S. Drew, regional engineer for the WPA, made a report on the dam which was submitted by the WPA to the district engineer of the army at Kansas City in March, 1936. Upon review of this report the army engineers recommended a more complete investigation of the foundations, including shear and consolidation tests, which report ultimately was sent to the WPA administrator in Kansas. Subsequently, in May of last year the recommendation was renewed following an examination of the site and about $2,500 was spent in taking additional borings at the site. The WPA also is reported to have called in a geologist to examine this site.

The project was approved at some stage in its progress by the Kansas division of water resources, which is required to pass on all dams more than 20 ft. in height.

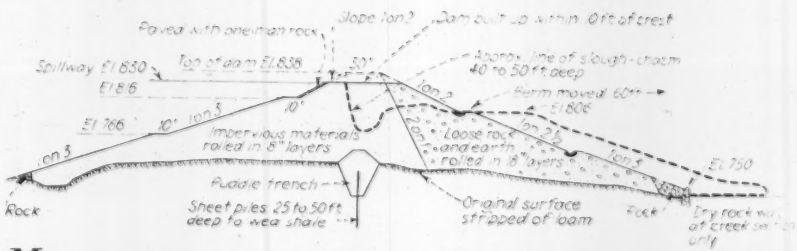
As built, with slight variation from the original plans, the dam consisted of rolled fill of impervious clay compacted in accordance with the Proctor method, backed by a downstream section of loose rock fill. Its bank slopes were normal, 2:1 to 3:1. A puddle trench carried 20 to 25 ft. down to blue clay as a cutoff under the foundation was supplemented by steel sheet-piling driven in the cutoff trench to the Wea shale, about 25 to 30 ft. below trench bottom. The sheetpiles extended some 10 ft. up into the puddle. Puddle trench and sheetpiling extended the full length across the valley and up both abutments. At the west abutment, which was steep, rock was exposed and a quarry near here supplied rock for the downstream face. The east abutment consisted of windblown loess, which material also formed the top layer of the subsoil across the flood plain for about half the width of the valley.

In preparing the site, all surface loam down to the loess was removed. The subsoil comprised a 20 to 30 ft. layer of blue clay underlying the loess, containing pockets of gravel and sand and softer material; then 10 ft. of Wea shale, eroded away on a 300-ft. width; then 10 ft. of block limestone, 5 to 8 ft. of Fontana shale, and a deep formation of Winterset cherty limestone, which underlies the whole area. The strata are essentially flat.

Foundation explorations before construction included ten core-borings down to Winterset limestone at intervals of about 100 ft. across the valley, and, between these, 17 auger holes and 4 test pits, generally carried to blue clay only. All were along the center of the crest.

(*Continued on page 535*)

THE SLUMP in the face of Marshall Creek Dam is nearly 700 ft. long and from 40 to 50 ft deep at the lowest point.


Paved with one man rock
Slope 1on2
Dam built up within 0 ft of crest
Spillway El 1830
Top of dam El 1838
El 1816
Approx. line of slough-crack 40 to 50 ft deep
Earth moved 60 ft
El 1806
El 1766
10'
1on3
2on3
Impervious material rolled in 8" layers
Loose rock and earth rolled in 8" layers
1on4
El 1750
Puddle trench
Rock
Sheet piles 25 to 50 ft deep to wea shale
Original surface stripped of loam
Dry rock wall at creek section only

MARSHALL CREEK DAM is an earth and rock-fill structure about 90 ft. high. The slump is shown in heavy lines.

Page Finds Confidence Among Irrigators

Special correspondence

A feeling of confidence in the future, such as never has prevailed before, exists on reclamation projects, according to John Page, Commissioner of Reclamation, who has just returned from a western trip. Continuing droughts have made for a new appreciation of irrigated land, Commissioner Page finds. While crops on the projects will break no records this year, they are abundant and are selling at prices that allow encouraging returns.

It is going to be difficult to meet the demands for irrigation coming from Montana, eastern Wyoming, western Nebraska and the Dakotas, Mr. Page explains, because the low heads of streams in that area preclude the obtaining of adequate water supplies.

Commissioner Page is encouraged by the action of delegates to the Federal Irrigation Congress from twenty-two districts in eleven states, in pledging themselves to request no further moratoria. Coming from an organization that has been strong for moratoria in the past, the resolution adopted at the Caldwell, Idaho, meeting is regarded as an indication of changing sentiment among water users.

Much credit is due to the men who installed the machinery at the Boulder Dam, Commissioner Page says. Four large units and one small unit were started without a single major difficulty. Output has been increased steadily up to 215,000 kw. Limits of the transmission line soon will be reached. Demand for power is increasing throughout the area at a remarkable rate, Mr. Page declares. The Southern California Edison Co. is ready to take power two years in advance of the contract schedule.

Revenues at Boulder Dam have passed the $200,000-a-month mark. Visitors are being shown through the plant at the rate of more than 500,000 a year, sales of the twenty-five cent tickets reveal.

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Lake Erie-Ohio Waterway Considered by Engineers

The Board of Engineers for Rivers and Harbors is considering a report on the Beaver-Mahoning waterway project received from the Ohio River division of the Corps of Engineers. The proposed channel would connect Lake Erie with the Ohio River. Details were not made public, and it is expected to be one or two months before the final action of the Board is made public.

Approval of a number of proposals has been announced by the Rivers and Harbors Board, Corps of Engineers. Among the more important, approval of which was made public September 24, was the project for improvement of Pearl River, above Bogalusa, La., by a navigation channel, at an estimated cost of $3,509,000, with maintenance and operation at $57,000 annually.

Other projects approved were improvement and flood control work on the Houston Ship Channel and Buffalo Bayou, to cost $9,000,000, Annapolis Harbor, Md., where modification of current plans are suggested, at an estimated cost of $29,500, and Twitch Cove and Big Thoroughfare River, Md., to cost $131,000.

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A.F. of L. Engineers Local Joins C.I.O. Group

The Marine Draftmen's Union, federal Local No. 2 of the International Federation of Technical Engineers, Architects and Draftsmen's Unions, affiliated with the American Federation of Labor, which has jurisdiction in the Brooklyn Navy Yard, voted at a membership meeting Sept. 21 to disassociate from its international and to affiliate with the Federation of Architects, Engineers, Chemists and Technicians, affiliated with the C.I.O. A subsequent referendum vote of the membership approved the decision by a large majority.

This action was taken by Local No. 2 as the result of dissatisfaction with the proceedings of the national convention of the international in Washington Sept. 13-16. Local No. 2 has been in existence for more than 18 years and was one of the largest locals in the international.

Local No. 2 now becomes the second local of marine draftsmen, engineers and naval architects to be affiliated with the F.A.E.C.T., the other one being in the Washington Navy Yard. It is expected that a separate marine department will be set up in the Federation at the forthcoming convention in October to handle matters connected with the shipbuilding industry.

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Mexicans Move to Exclude American Engineers

A group of Mexican engineers has petitioned the Mexican congress to enact legislation which will exclude foreign technicians from all industries in that country. The petitioners insist that such exclusion is the only means of assuring Mexican engineers employment to the extent they deserve.

Water Pact Difficult With Mexico

Special correspondence

Negotiation of a treaty with Mexico covering the use of the waters of the Colorado and Rio Grande rivers faces many difficulties. It is the major assignment of Sumner Welles, the State Department's premier negotiator.

Mexican water users on the Colorado below the American boundary are expected to demand a minimum of 1,800,000 acre feet of water. It is contended that this amount is necessary to supply the 600,000 acres now under cultivation in that area. Since only 7,500,000 acre feet are available for use in the lower basin, the United States is not in a position to spare that amount of water.

The United States, however, is in a position to trade as between Colorado river water and Rio Grande river water. The matter is complicated further by the difficulty of securing enforcement of any agreement that may be reached with Mexico. A system of communal farming has been set up below the border, and all of the American-owned land has been seized. The Colorado river area is practically independent of the central government of Mexico. As the federal government is socialisticaffly inclined, there is doubt as to how wholeheartedly it may be expected to put a treaty into effect when it may involve a military occupation of the area.

The recent strike among workers on the Imperial Canal in Mexico is a reminder of how precarious is the continuation of water supply for the Imperial valley. It depends upon the whim of a loosely-organized, socialistic community. This menace is certain to overhang the Imperial Valley until the spring of 1939, which is the earliest possible time that water from the All-American Canal may be expected.

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New Hydro Plant Planned In Wisconsin

Construction of a $1,500,000 hydro electric plant on the Wisconsin River is planned by the Wisconsin Public Service Corp., which will shortly file an application with the Wisconsin Public Service Commission. Additional sources of power are needed to meet the increased sales of electricity in the territory. Construction is expected to start during 1938.

The proposed plant will have a capacity of about 17,500 kw. It will be situated on the Wisconsin River between Merrill and Tomahawk.

Cement Firms Deny Monopoly Charges

Replies to FTC complaint say multiple basing point system is not illegal

Replies have been received from the Cement Institute and its members, who control about 95 per cent of the cement production in the country, to charges made last July by the Federal Trade Commission that practices of the Institue constitute illegal restraints on trade under the Federal Trade Commission Act and the Robinson-Patman act. (*ENR*, July 8, 1937, p. 44). The replies deny that the basin-point system of determining prices, under which the price of cement at any point is set at the price at one of a number of "basing points" plus transportation from basing point to point of delivery, on which the Trade Commission's complaint was based, is illegal.

In substance, the Commission's complaint charged that, under the multiple basing point price system used in marketing cement, competition is stifled and price discrimination results because the net return received by each company varies with the point of delivery. It was inspired largely by Secretary Ickes' indignation at receiving, from time to time, bids identical to the fourth decimal place on cement and steel. Ickes complained to President Roosevelt; the President referred the matter to Attorney-General Cummings for study, and the Attorney-General, after a long period of thought, reported back that the matter could best be handled by the Federal Trade Commission. If the Commission issues a cease and desist order and if it is upheld by the courts the result will affect not only the cement industry, but numerous others that are set up on a similar basing-point price system.

The cement industry's answer to the Commission's charges, as distilled from the scores of briefs submitted, is a bland admission of what everyone knows—that cement is customarily quoted and sold at a delivered price—and a catagorical denial that there is any mutual understanding or concerted action to maintain the system. It is simply an established trade custom dating back to the beginning of the century, and is founded on the buyers' knowledge that, in general, X's cement is as good as Y's or Z's to all practical purposes. Production methods and costs are standardized, and any bidder on a job knows that in order to compete he must meet the quotation of the nearest producer.

The Cement Institute's service, the replies state, is statistical, and it has never influenced the marketing policies or methods of its members. Its purpose is to make available to its members accurate figures relating to credits, contracts closed, production stocks on hand, and bag returns. Some of these services have been discontinued and all of them have been upheld by the U. S. Supreme Court when the Institute's predecessor, the Cement Manufacturers Protective Association, was haled into court by the Department of Justice in 1925.

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Big Increase in New York In License Applications

The New York State Board of Examiners of Professional Engineers and Land Surveyors considered 7,173 applications for licenses, during the year ended June 30, 1937. This represents an increase of 62 per cent over the number of applications considered during the year ended June 30, 1936 and is about four times the number considered during the year ended June 30, 1935. Of the applications considered, 3,099 were recommended for licenses. Further consideration was required on 769 applications, 1,795 were held for written examination and 1,510 were rejected.

On June 30, 1937, 11,909 men held professional engineers or land surveyors licenses. Of these, 2,936 held both types of licenses, 8,220 held only the engineer's license and 753 held only the land surveyor's license. These figures cover only licenses actively in force in June. About 18,000 persons have received licenses since the New York State Licensing Law was originally enacted.

Only one written examination was held during the period covered by the report. At this examination, in February 1937, 603 candidates appeared and 477 of these were recommended for licenses; 41 were rejected and 85 were held for re-examination on one subject.

An amendment to the licensing law made during the 1937 session of the State Legislature, provided that nonresidents having no established place of business in the state shall only be exempted from the provisions of the act if they are legally qualified to practice in their own state or county. It was further decided that exemption from the requirements of the act, granted to new residents of the state during the period required for the examining board to act upon its application for license, will only be granted if the applicant is legally qualified to practice in his previous residence.

Water Works Meet

(*Continued from page 523*)

can be instituted by: (1) improving the resistance of metals by the use of alloys; (2) applying artificial coatings on pipe; and (3) by corrective treatment of the soil and water environment. The use of spun bituminous coatings for water pipe protection against corrosion was described by George E. Boyd, district manager, Wailes Dove-Hermiston Corporation, New York. British pipe-coating practice was discussed by J. Mitchell, of London.

Gravel-packed wells

Operating experiences with low velocity gravel-packed wells in Massachusetts was the subject of a symposium led by Paul Howard, consulting engineer, Boston. At Attleboro, installation of this type of well recently supplanted a group of 2½ in. high velocity wells in order to obtain water of low iron content. Soil in this region contains much iron and, according to Mr. Howard, the pumping at high velocity exhausts the oxygen in the water and this causes iron to be taken into solution. The new wells produce a water with only 0.18 p.p.m. of iron; formerly the water from the small wells contained up to 1.94 p.p.m.

The importance of thorough tests to insure proper selection of a well site was stressed by Bayard F. Snow, president, Henry Goodnough, Inc., engineers, Boston, who described the installation of the Needham gravel-packed well. At this place, by use of observation wells and careful analyses of drawdown curves under various rates of pumping, it was possible to limit the site selection for the well within an area only 100 ft. square.

A dollar and cents evaluation of water purification was presented in a paper by Arthur L. Shaw and E. Sherman Chase, of Metcalf and Eddy, Boston. Since few natural supplies possess all the desirable characteristics associated with the term pure water, treatment of some kind usually must be provided. As a rough estimate of economic value of various treatment measures the following figures were given as representative of the annual loss per million gallons daily of water consumed due to impaired supplies: $20,000 per death from water-borne typhoid; color and turbidity removal, $200 per p.p.m. over ten, and $400 per p.p.m. over five, respectively; hardness, $150 per p.p.m. over 100; and iron and manganese removal, $1,000 per p.p.m.

Other papers of the meeting dealt with purification technique, model tests and distribution practice. The complete report of the convention will be published in next week's issue.

WASHINGTON HIGHLIGHTS

Special reports by Paul Wooton

ATTORNEYS for Greenwood County, S. C., have filed a brief with the U. S. Supreme Court asking it not to review the request of the Duke Power Company for an injunction against a PWA allotment for the construction of the Buzzards Roost hydroelectric power project. Should the request be granted the decision of the Circuit Court of Appeals denying an injunction would be final.

Preparation of designs for the completion of the Grand Coulee dam is being expedited at the Denver office of the Bureau of Reclamation. The call for bids will be made early in December, it is expected. The contract will be let subject to further appropriations. Indications are that three concerns will submit bids.

Water use studies in cities of less than 100,000 are being started by the Marketing Research Division of the Commerce Department. Wide interest was manifested in a recently published study covering the larger cities. The information is particularly needed at this time because of its bearing upon air conditioning installations.

The name of Morris L. Cooke, first administrator of the Rural Electrification Administration, is being suggested for the position of Bonneville administrator, as a possible alternative to J. D. Ross. Although Mr. Cooke's real interest is now land conservation and related problems, he is by training and experience fitted to assume the Bonneville job, having served with Pennsylvania's Giant Power Survey and with the New York Power Authority.

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Dam Foundation Failure

(Continued from page 532)

The puddle trench was filled with gray clay hauled in from a wet borrow-pit a quarter-mile upstream. This material was worked to fairly soft consistency by drawing a dragline bucket through it; some water was added in the trench. The compacted fill was built over it progressively from the sides.

The embankment fill, about 800,000 cu.yd. total, was placed in 8-in. layers, compacted by 12 to 14 passes of tractor-hauled sheepsfoot rollers; its moisture content ranged from 14 to 16 per cent. Inspection of the dam on Sept. 25, 5-½ days after the failure, showed well-compacted clay layers of about 4-in. thickness in regular sequence. Statements from engineers connected with the work were to the effect that close laboratory supervision of the fill construction had been maintained, continuous tests of the degree of compaction being made. The face upstream of the break was almost vertical, at least 40 ft. high. According to an engineer who had seen the Lafayette Dam slide within a few days after it occurred, the Marshall Creek slide was remarkably like that at Lafayette, which were due to deficient foundation strength.

The slide is under investigation by a board of survey, which is also to recommend the further disposition or reconstruction of the dam. Additional test borings have already been begun by this board, which includes representatives of the four agencies concerned: H. L. Reppart, WPA director of operations for Kansas; R. V. Smrha, chief engineer of the state Division of Water Resources; G. A. Hathaway, principal engineer, Missouri Division office, Engineer Department, U. S. A.; and R. E. McDonnell, consulting engineer (Burns & McDonnell), representing the county.

LABOR NOTES

A STRIKE of building trades workers called, union spokesmen stated, to put a stop to contractors enforcing a kickback of wages, thus evading government regulations, halted work on about 45 WPA projects in New York City Sept 24. The strikers were not WPA workers but were employed by contractors doing work for the WPA. The strike was called by the International Union of Operating Engineers, the rock drillers union, blacksmiths union, blasters union, and the hod carriers and common laborers union, all members of the A.F. of L.

At Trenton, N. J., also, building work was tied up when 200 employees of John McShain, general contractor on the new $2,000,000 plant of General Motors Corp., went on strike, claiming that they were being furnished with concrete mixed by non-union workmen. The Warner Co., which is supplying concrete for the job, asserted, however, that their mixing plant was organized, employees belonging to the concrete mixers union.

Wide World Photo

THEY HOPE TO BUILD HOUSES

REPRESENTATIVES of local housing authorities and state boards of housing and mayors of cities planning the organization of housing authorities met in Washington Sept. 24-25 for a conference with Secretary Ickes and federal housing officials to discuss the practical details and familiarize themselves with the requirements of the low-cost federal housing program set up at the recent session of Congress.

Left to right above are: George E. Evans, chairman of the Pennsylvania housing board; Langdon Post, New York City tenement house commissioner and president of the American Federation of Housing Authorities; Mayor Cornelious D. Scully of Pittsburgh; and John Carroll, chairman of the Massachusetts state housing board.

News Continued on page 573

COMMENT AND DISCUSSION

Readers' opinions on matters that concern the engineer

Zoning Protects the Citizen

Sir: W. L. Henderson's "challenge" (in your Sept. 9 issue) to the practice of zoning municipalities to regulate the use and height of buildings and the areas of the yards surrounding them cannot be entirely ignored by those who have been following, either professionally or as interested officials and laymen, the progress of the zoning movement during the last twenty years.

In 1934 a countrywide survey by the National Planning Board listed 1,244 zoned municipalities in the United States. That this list was probably incomplete is shown by the fact that a detailed survey by the Division of State Planning in New York State in 1937 showed 233 in that one state.

Mr. Henderson classifies city planning and zoning as entirely separate and distinct, extolling the former while he condemns the latter. Zoning has often been done separately, but it is generally conceded today that it is an important part of city planning and that the two should be worked out together and by the same agency. They both require control to prevent being made ineffective by conflicting building development.

Zoning is not arbitrary, as it provides for ample review by a board of appeals and by the courts; it can be, and often is, amended on petition of affected property owners. Far from being "guesswork", it must always be based on a complete survey of existing uses. Its purposes are the maintenance and protection of the very things which Mr. Henderson states, as his opinion, that it destroys.

It is significant that Mr. Henderson comes from Detroit, one of the few large cities that have not availed themselves of this protection and safeguard. That his views are not universally shared in that city is indicated by the following statement made by Judson Bradway, former president of the Detroit City Plan Commission, at the National Planning Conference held in that city last June:

"In my opinion, it is impossible to plan the future of a city intelligently without zoning, and the passage of an adequate ordinance should be, and I am sure is, the major object and consideration of the plan commission at this time."

I am quite confident that none of the residents of the municipalities now zoned would care to discard this protection unless it be speculative builders who are prevented from capitalizing their own holdings at the expense of adjoining properties.

New York, Sept 21, 1937 — HAROLD M. LEWIS, Engineer, Regional Plan Association

"Force-Account" Defined

Sir: May I have a bit of your space for an appeal to that small percentage of the civil engineers of the country who fail to differentiate between day-labor and force-account methods of carrying on construction and thus perpetuate a deplorable and entirely unnecessary confusion in terminology. Except in direct quotations from other sources, I have never noted this error in contractor's magazines such as *The Constructor* of the A. G. C. of America and *The Bulletin* of the G. C. A. of New York, though I have been a constant reader of both these magazines for many years.

Force-account is not "a development of the day-labor system," but is distinctly a part of the lump-sum contract system. That is, the term arose on lump-sum contract work when part of the work, such as foundations, could not be designed readily in advance and therefore could not be included in the bid. These parts of the work were not "extras", but were foreseen; and it was only natural to designate them force-account work since the engineer was required to keep account of the force of the contractor employed upon them. Thus the effect was really to apply a cost-plus method to parts of a lump-sum contract.

This confusion in terminology can be eliminated very easily if all engineers will restrict the term force-account to this original meaning, and I am sending this communication to the editors of several engineering magazines in the hope that this desirable purpose may be consummated as quickly as possible, since delay only adds to the confusion.

Ithaca, N. Y. Sept 22, 1937 — FRED A. BARNES, Professor of Railroad Engineering

Engineer-Employer Blamed

Sir: *The engineer-employer is largely responsible for the relatively low economic level of the engineering profession.*

This, in substance, was the gist of the presidential address of Louis C. Hill, at the 67th Annual Convention of the American Society of Civil Engineers, held in Detroit, July 19-22.

Mr. Hill's opinion cannot be taken lightly. He is an engineer of national reputation, whose broad experience covers many years of important work. He is familiar with every phase of the engineer's life and, as such, is preeminently qualified to judge our problem.

The address of Mr. Hill was basically a discussion of the trade union question, in so far as it affects the engineering profession. He recognizes a fundamental fact: that engineers are motivated to join union ranks largely because they feel that it is the best way to obtain higher levels of pay. Mr. Hill does not agree with these engineers. He places the blame for their condition squarely upon others in their own profession, and at the same time places the responsibility upon them, in the form of a definite duty to assume, actively and individually, the obligations of the dual function of employee-employer. "Such a duty goes far beyond the administration of the work of engineers subordinate to him; it involves real concern for the working conditions of those subordinates and for the monetary and other rewards they receive for the work which they do."

In making this address, Mr. Hill has done the engineers a great service. He has not only placed the matter officially before the engineering profession, but he has also given them the answer to their most vital problem. Seldom does such an oppor-

tunity come to any individual. Even more seldom does the individual grasp the opportunity. We owe Mr. Hill a great debt of gratitude.

Many thoughts have been expressed recently regarding the moot question of unionization of engineers. That there is a definite trend in this direction, backed by various forms of pressure, is not to be denied. We all know that the movement is in progress.

There is a tendency for each individual group of engineers to rush into the fray, expounding its own viewpoint, and setting forth that viewpoint as purporting to voice the opinions of engineers in general. This is a tactical error of major importance.

The first and most essential step which should be taken is to form a committee, composed of representatives from each organization of engineers, for the purpose of making a truly representative body. This committee should also include one or more representatives from among engineers at large, who are not members of any engineering organization. A committee so formed could speak with a voice which would merit well-deserved consideration. It would truly represent the opinions of engineers as a group, and would be recognized as such.

As matters now stand, there is no such representative committee in existence, and there is no effective way of either obtaining a representative opinion or of taking concerted action. The unionization movement will, sooner or later, demand unified opinion, deliberation, debate, and finally some stand on the matter. It cannot be ignored, nor can it be successfully decided upon by the sporadic action of individual groups.

It should be recognized that we are faced by a great basic decision, one which will affect our whole future, and one which demands unity of thought and action. It is up to us to exert every effort to bring about such unity.

Action with unity will produce results; disjointed action without unity is futile.

And, finally, let us all realize that we as engineers, must solve our own problems. No one else is going to do it for us.

E. H. Clarkson, Jr.

Los Angeles, Calif.,
Sept. 15, 1937.

Cities and Airports

Sir: The editorial, "White Elephant Airports" (*ENR* Sept. 9, 1937, p. 419) raises some of the problems associated with the airport question, but there are many more matters to be considered before the subject is to be completely handled with satisfaction. Also much work and thought must continue to be devoted to this question. However, we must remember that all aviation activity is moving with such rapidity that any definite pattern selected at this time would be outmoded within a relatively few months. It is not thought that any municipality is wasting or will waste any money on airports, but that more probably many may be extravagant of their future by parsimonious treatment of air facilities.

Washington, D. C. J. M. Johnson
Sept. 20, 1937. Asst. Secretary of Commerce.

National Public Works

Sir: May I comment on your Sept. 16 editorial on National Pubic Works, the crux of which appears in the last sentence, which I heartily endorse.

The engineers in American Engineering Council have studied this problem for years, and at the last meeting in January took affirmative action favoring the establishment of a Department of Public Works.

The President's Committee on Administrative Management, in its report in January 1937, provides for a new Department of Public Works, ". . . to design, construct and maintain large-scale public works". . . . The men on this committee, Messrs. Brownlow, Gulick and Merriam, are all experts in administrative management.

The Brookings Institution report says—"the creation of a central public works organization to undertake all construction for the federal government does not appear to offer any advantages, either in economy or efficiency," so they conclude it inadvisable to unite them all in a single department.

As opposed to this proposal of the Brookings Institution, let me quote from a report made in 1926 by a committee of American Engineering Council composed of seven men experienced in management and organization, who spent months of intensive study and research of the public works of the various departments of the federal government, and then definitely recommended a concentration of all public works into one department and found that the change:

1. Would be "in the interests of simplicity."

2. Would represent "logic and common sense in the association of the various activities."

3. "Makes it possible to reduce overhead costs."

4. Would result in "elimination of much duplication," and

5. Follows a "plan developed in any number of state and municipal organizations."

We have here, therefore, a report of what we may call our own experts, diametrically opposite to the Brookings recommendation. The 1926 report differs from our present point of view in making the Department of Interior the nucleus of the public works, while now we favor a separate department.

We might take issue with the Brookings Institution on the distribution of some of the bureaus, but the important objective is, as you have stated, "a well-knit organization to carry on the national government's increasingly important engineering and construction work."

Chicago, Ill. Alonzo J. Hammond
Sept. 22, 1937. Chairman, American Engineering Council Committee on Public Works.

Waterworks Management

Sir: It was a privilege and pleasure to read the three articles on waterworks management by E. G. Plowman (*ENR* Aug. 5, 12, 19). If only all our municipal politicans could read them, I am quite sure the average utility would benefit.

In Wisconsin we seem to be quite fortunate in having a Public Service Commission which has made every effort to keep municipally-owned utilities out of political graft. The state statutes are so written that the local politicians can only select the Board of Water Commissioners who in turn are elected by the Council.

These articles should be spread over a greater range of publications so that every public official would see them.

Waukesha, Wis. A. P. Kuranz,
Aug. 30, 1937 Superintendent,
Waukesha Water Department

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SEPTEMBER 30, 1937

PUBLIC-WORKS ACTIVITY is nearing the end of a transition period. As federal assistance tapers off the hesitation of cities to pursue their normal routine of improvements loses its justification. Depression clouds have lifted, and, as the winds of opportunity are favorable, sail should be set accordingly. The deficit of needed facilities that has accumulated is recognized by officials as well as engineers, for the work undertaken under the stimulus of federal grants and loans hardly scratched the surface of what needs to be done. Thus, every city has a big program of rehabilitation and betterment ahead. And no time is more propitious than the present for starting on this program because of good tax collections and excellent credit. True, this financial vitality is no license for ill-considered use of funds for public works; but it offers municipalities unexcelled opportunity for profitable investment—soundly planned and prudently financed investment in the works needed to serve industry and citizen more efficiently and lay a solid foundation for civic growth.

Exit PWA

IT IS WELL for citizen and engineer alike to take careful note of the just-announced closing of PWA allocations, for it signalizes in unmistakable manner the end of the municipal-finance emergency that was the main reason for institution of the federal loan-and-grant system. Forceful reasons have been advanced (see for example *ENR* Sept. 23, 1937, p. 514) for retaining the PWA as a better means of doing a large part of the work now assigned to WPA, and the sensational failure of a WPA-built dam in Kansas speaks strongly in the same direction. But whatever new functions may be assigned to the tried-and-tested PWA organization, its function as financial lifeguard to cities is over. And this *means* over. The previous closing of PWA's purse, nearly two years ago, an attempt at executive overriding of the will of Congress, was vetoed by the force of public opposition. But that opposition has disappeared with the rehabilitation of the cities' financial strength; the majority of skilled workers are back at their jobs; and so federal subsidy of local improvements through PWA had to come to an end. Now the city is back on its own. Its future is in the hands of its citizens.

Cleanup Progress

CONSISTENT ADVANCE toward the goal of adequate sewage treatment for New York is made evident by the construction of the Tallmans Island plant. Third modern plant to be built by the city within the space of a few years, it forms part of an ultimate program of 38 treatment works, and it gives added promise that the objectives of this program will soon be realized. The Coney Island plant is already in operation, the big Ward Island plant is nearing completion despite delay caused by depression difficulties. Both these plants were built with the aid of federal emergency funds, but the Tallmans Island plant has been financed entirely by the city. The change is significant; it is indicative of the city's sincerity in pollution abatement.

Twelve Thousand Engineers

NEW YORK STATE now has 12,000 licensed engineers! In the year ending June 30, 3,100 were added to the list. This is 62 per cent more than in 1936 and four times the number licensed in 1935. And at that the number passed is only half those who applied for license. These figures are impressive. The large increase in applicants is in part explained by the fact that the license law authorized the license board to require written examination of all applicants beginning last January. But more prosperous times also are believed to be responsible in part for the increase. Young men who found it difficult to raise the initial fee now are coming forward for examination. Five years ago pessimists were saying that they would not advise any young man to take up engineering. Last year over seven thousand in New York State alone sought to lay the foundation for a future in that field of activity.

Gains in Welding

STATISTICS recently announced by the American Iron and Steel Institute reveal that welding is improving its position relatively as well as actually. Thus, while steel ingot production has increased 250 per cent since 1932, production of welding wire is up 480 per cent. In 1936, more than 140,000,000 lb. of wire was manufactured, or 2.95 lb. per ton of steel ingots produced. This is an increase from 1.79 per ton of ingots in 1932, and was reached by the addition of continuously larger increments each year. Of the 140,000,000 lb. of wire, the electric-arc process claims 111,000,000 lb. or 80 per cent. Freight cars, pressure vessels, automobiles, containers, machinery and

ships and pipe lines consume the largest part of the welding wire production. But structural welding consumption is increasing, and if the recent approval of welding in the New York building code exerts the expected effect, this consumption is due for a steady increase.

Ever-present Danger

FIRE THAT DESTROYED the top plant of a compressed-air section of the Minneapolis-St. Paul intercepting sewer tunnel last week fortunately caused no loss of life, but it did serve warning of an ever-present hazard on all tunnel work. Grouping of equipment close together in wooden sheds is an invitation to disaster, for in case of fire the entire top plant is rendered useless. Vital lines supplying air, power and light, even though they are installed in duplicate as a safety measure, are undependable when centered in flimsy wooden shacks. Separation of various plant items in independent fire-resisting housing is necessary to prevent a possible major tunnel disaster from a top fire. Let the St. Paul case be a warning.

Beyond Zoning

MORE THAN TWO DECADES have elapsed since the introduction of zoning in the United States. The first ordinance was adopted in New York in 1916 and at the present time there are over 1,300 municipalities that employ some form of land use and building regulation. Yet zoning continues to be one of the most controversial of municipal issues, the subject of unstinted praise and bitter condemnation.

It forms the battleground between long-established property rights on the one side, and on the other side community rights that are clearly superior but in the main are intangible and uncertain. With justice, many harmful effects are charged against zoning, and with justice also its stabilizing and protective effects are pointed out, as by Harland Bartholomew this week.

In this conflict it is essential to recognize the conditions that surround zoning: the frequent faults of zoning laws, drafted without adequate knowledge of the subject or blindly copied from those of other cities; zoning by fanciful ideal rather than reality; weak-kneed rezoning or grant of exceptions on the demand of individual interests to the injury of whole neighborhoods; and perhaps most serious of all the inevitable tendency to overzone for business uses. Every step of progress in solving these complications will make zoning more beneficial and less harmful. But it must also be remembered that no zoner and no zoning body is wise enough to foresee or powerful enough to fix the course of coming city development. The possibilities of zoning are limited by this fact.

The most far-sighted zoning cannot keep houses from becoming superannuated and obsolete or check their loss of value and their transfer to lower grades of use. Despite twenty years of experience, zoning has not demonstrated its ability to prevent the decay of city districts as they grow old, and unless new methods of neighborhood rejuvenation are discovered it probably never will accomplish this end. Its great function is temporary: to protect and preserve the structure of a city so long as that structure continues to serve best the living needs of the civic organism. Means that lie beyond zoning must be depended on to restore lost value and function and to rearrange the city's structure when modernization is in order.

Full Inquiry Due

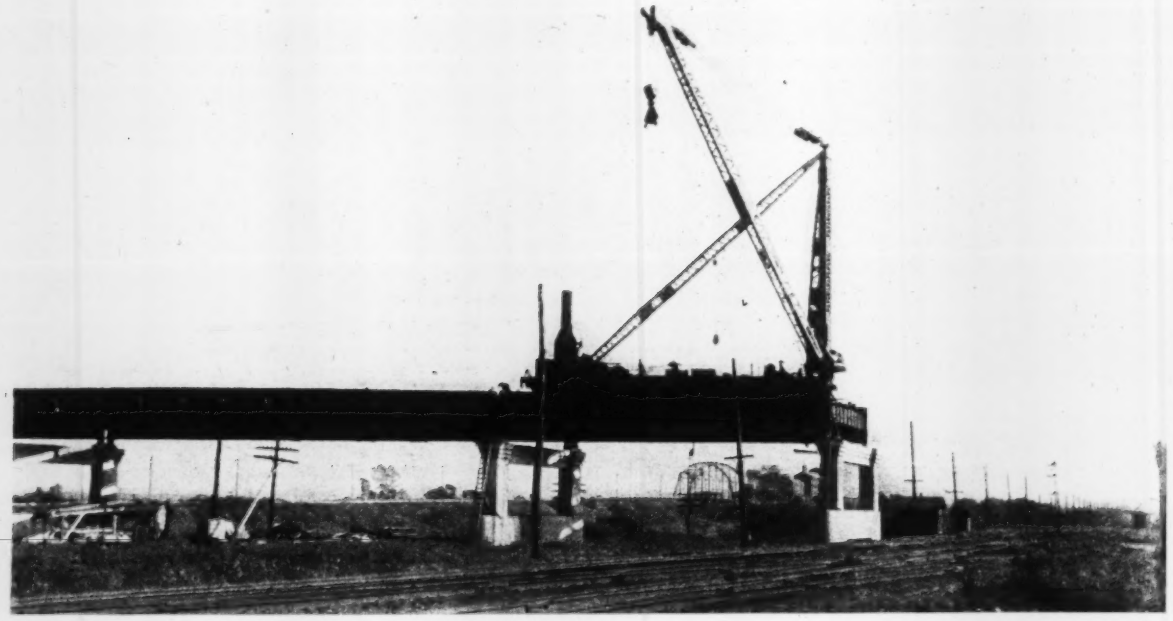
FAILURE of the big earth dam across Marshall Creek in Kansas, a WPA project, is surrounded by circumstances that bristle with points of question. Full inquiry is due, in order to clear up these questions. The engineering phases of the failure obviously need to be explored, but the WPA's handling of the project also should be examined.

It is hardly necessary to say that piling up a mass of earth eighty or ninety feet high to form a dam imposes a severe load on the ground beneath —in this case something like five tons per square foot. Only sound and firm ground can safely carry such a load; soft and plastic subsoil may squeeze out sideways under the pressure and drop the dam into the hole it leaves. The facts reported to date indicate that this is what happened at Marshall Creek.

It is therefore important to determine how fully the Marshall Creek site was explored and how its safety was verified. The soil should be completely studied to reveal the nature of its weakness and to explain why this weakness was not detected in advance. In the same connection the inquiry ought to show whether the WPA officials had been warned to test the subsoil, and whether they heeded these warnings. There is reason to believe that they had been repeatedly urged to make strength tests of the foundation soil.

These questions are the more insistent because WPA operations often lack the definite allocation of engineering and construction responsibilities that protect normal construction. If the Marshall Creek work was so conducted as to place its responsibility and competence in doubt, the public should be quickly informed, for if such uncertainty and risk is inherent in the WPA system the undertaking of major engineering construction by WPA must be regarded as a public danger.

PICTURES IN THE NEWS



FROM GOLDEN GATE to Buffalo. This 138-ton traveler used by the Bethlehem Steel Co. on Golden Gate Bridge is now being used to erect 71-ton girders for the Tifft St. Viaduct at Buffalo.

Bureau of Reclamation Photo

A SIPHON of 3-ft. steel pipe supported on a cable suspension bridge will carry waters of the South Ogden High-line Canal across the Ogden River Canyon near Ogden, Utah.

New York Adds Another Sewage Plant

Third project in a contemplated program of 38 treatment units, the Tallmans Island activated sludge plant will end pollution of Flushing Bay

IN NEW YORK CITY the efforts of years to provide adequate sewage treatment facilities for seven million people have lately resulted in the construction of two large modern plants—the Coney Island installation which went into operation about a year ago, and the Wards Island activated sludge plant which is expected to be in operation before the end of this year. Now under construction is the Tallmans Island activated sludge plant, third project in the list of 38 plants tentatively planned to care for the entire sewage flow of the city.

Thus far the installation of these needed plants in planned progression has involved the selection of strategic points for earliest attention. The Tallmans Island plant was selected for immediate construction because of its function in removing pollution from the Flushing River and the easterly side of Flushing Bay upon which the 1939 World's Fair site is located.

It is contemplated in connection with the Fair, that Flushing Bay will be utilized by craft of all kinds and that a series of lagoons leading from Flushing River will be developed within the fair grounds. The proposed plant therefore plays a vital part in removing from these waters the discharge of existing sewers and in handling the sewage originating from the transient population visiting the Fair.

Sewage pollution entering Flushing Bay on the westerly side will be remedied by the construction of a sewer known as the Ditmars Boulevard intercepting sewer in conjunction with the rehabilitation and enlargement of the present North Beach screening plant. This and the new Tallmans Island plant will both be in operation during the coming year. Their operation well in advance of the opening of the fair in May 1939 will have a marked effect in making the waters of the bay and Flushing River attractive for varied uses during the exposition, now in preparation.

Although certain units have a larger rating, the initial capacity of the treatment works at Tallmans Island will be 40 million gallons

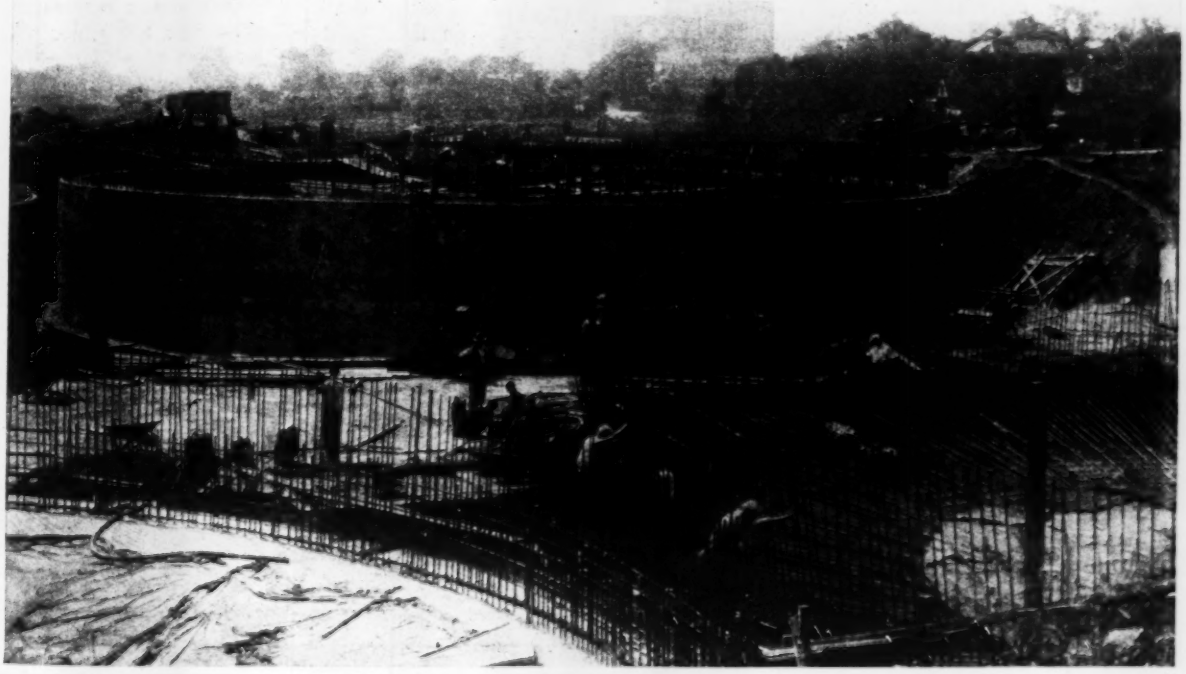


Fig. 1. Clustered around a central control room are the four conical-bottom digestion tanks, each 83 ft. in diameter.

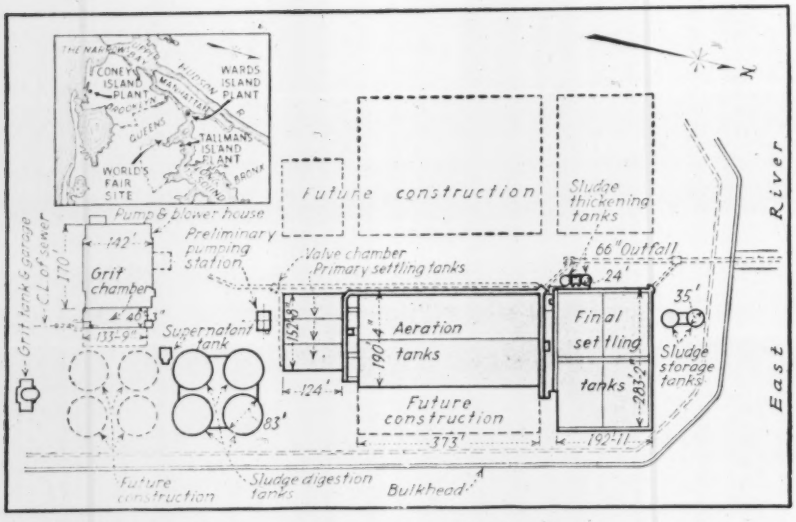


Fig. 2. General layout of the Tallmans Island sewage treatment plant.

daily; provision has been made, however, for an ultimate capacity of 80 m.g.d. Since seasonal variations in the degree of treatment are not required at this location, the activated sludge type of treatment was selected as best suited to the local requirements and to the broader objectives of the New York program.

The main features of the plant involve a pump and blower house, rectangular primary sedimentation tanks, aeration tanks, and rectangular secondary sedimentation tanks. Primary and excess activated sludge will be digested and the digested sludge barged to sea. Gas from the digestion tanks will be utilized in internal combustion engines to provide part of the power required to operate the plant.

The cost of the project is estimated at $4,100,000. Already completed at an expenditure of about a third of a million dollars, are a bulkhead, pier and a portion of the outfall sewer. The largest single contract, covering the major tanks and structures, was recently awarded for an amount totalling $1,500,000.

Work now under construction totals about 55 per cent of the estimated final cost of the plant.

Development of site

The new plant is located in the northern part of the borough of Queens, which, though part of the mainland, is known as Tallmans Island. Comprising an area of about 26 acres the site consists of a wooded promontory rising from all sides to form a central hill 35 ft. high and readily visible from the numerous vessels in the East River.

The prominent location of the plant and the anticipated interest of World's Fair visitors provide important reasons for the careful planning which has been given to secure a unified layout with carefully landscaped grounds.

To permit full development of the site a bulkhead is being built along the easterly half of the area. At the northerly end of the tract a pier, 300 ft. long and 34 ft. wide, is under construction. The water depth alongside this pier will be sufficient to accommodate sludge vessels. Beneath the pier is located the outer portion of the 6 ft. 5 in. outfall sewer which will discharge into a 21 ft. depth of water.

The drainage area served by the plant lies in the northerly part of Queens along the East River and extends from the east city line westerly to Flushing Bay. The area to be served is about 17,000 acres of which only 3,800 acres or 22 per cent are at present sewered. Lying between this and the adjacent drainage area served by the North Beach plant is the World's Fair site, a long narrow tract of 1,130 acres lying along the Flushing River.

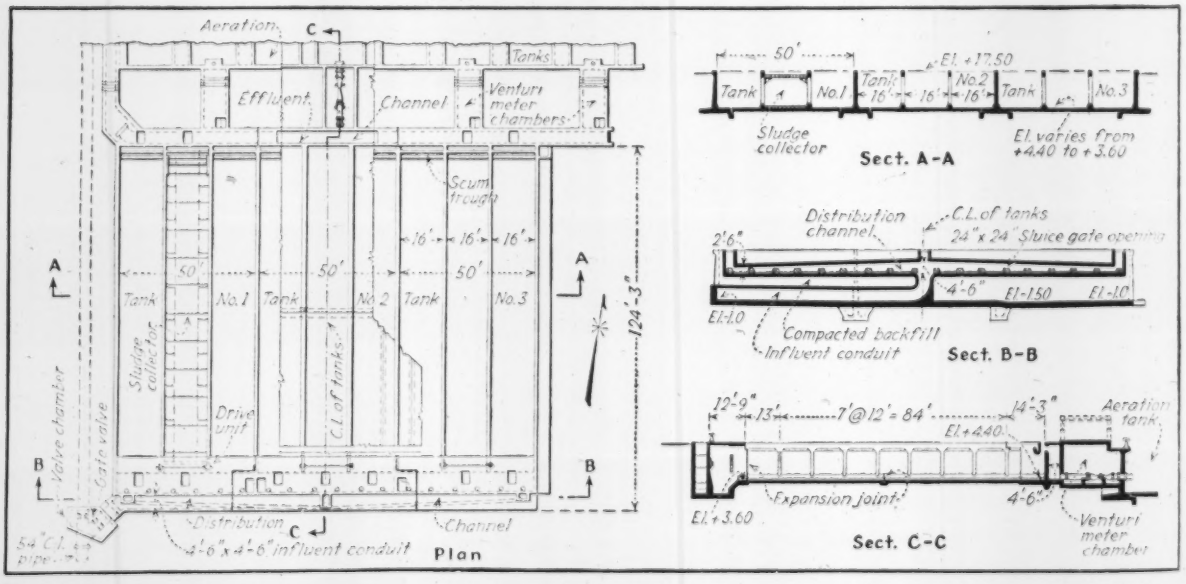


Fig. 3. Primary settling tanks are equipped with conveyor type sludge collectors. Note the unusual design of the influent distribution channel (Sect. B-B).

Population studies indicated that a capacity sufficient for 1970 provides for the future growth of this district up to the point of saturation expected to be reached at that time.

These studies showed a progressive increase of population within the drainage area of from 29,000 in 1905 to 114,600 in 1930. Projecting these figures, the design population of 550,000 for 1970 was obtained. The population basis for present construction was taken as 300,000. It appears likely that this total, which is about twice the present population within the drainage area, will be reached by 1953.

Factors affecting flow

Having arrived at a population basis upon which to predict sewage flows, studies were extended to capacity to take into account principally water consumption and infiltration data. Since the district is typically residential, no problems of industrial wastes were involved.

The average daily water consumption in 1930 was about 106 gal. per capita but experience has indicated that this will increase to 125 gal. in 1970; about 90 per cent reaches the sewers. Private water supplies within the area are negligible.

Infiltration, though held to close limits in new construction, is considered a definite contribution to the flow from previously built sewers in the district. It is estimated to approach 1,200 gal. per acre per day from the entire area.

From the sewered area the initial flow to the plant has been estimated as 10 to 12 m.g.d. For design purposes, the maximum flow is assumed to be twice the average and the minimum 65 per cent of the average.

Since no reliable sample of the composite sewage to reach the plant could be obtained, the determination of suspended solids in the flow was based upon experience and upon the characteristics of presumably similar New York City sewage. For design purposes this was fixed at 0.26 lb. per capita.

Pump and blower house

The largest building at the plant and dominating the view when approaching from the mainland is the pump and blower house. In it will be housed practically all of the mechanical equipment with the exception of the settling tank mechanisms and the airlift pumps. The substructure of this building comprises principally a large room in which the main sewage pumps and auxiliary equipment are located. Grit chambers at the substructure level are provided in an extension on the east side of the building.

Fig. 4. The plant outfall sewer, 6 ft. 5 in. in dia., passes through a bulkhead and extends underneath a 300-ft. pier to deep water.

In the superstructure the outstanding feature is the large open machinery room free from columns and served by a traveling crane of 100 ft. span. In this room will be located the gas engines driving the pumps and the air blowers which will be direct-connected to gas engines. In the wings space is provided for the electrical, ventilating, and air filter equipment. They likewise provide facilities for the plant workmen, and space for a laboratory.

Sewage Pumps—The main sewage pumps will be located in the substructure and will be driven through angle gears by the gas engines on the grade floor. Four pumps will be provided—two 35 m.g.d. units driven by three 50 hp. engines and two 15 m.g.d. units driven by 150 hp. engines. Space is provided for the future installation of a 35 m.g.d. pump. Installation of this unit would bring the total installed capacity to 135 m.g.d. or 169 per cent of the future design flow. A further increase in capacity may be obtained if needed by replacing the two present 15 m.g.d. pumps by 35 m.g.d. units.

Auxiliary Equipment—In addition to the pumps, most of the auxiliary machinery will be located on the substructure or basement floor. This includes mainly the cooling water pumps, lubricating oil pumps, tanks and purifiers, starting air compressors and receivers, engine silencers, heat exchangers and the heating plant.

Air filters supplying combustion air for the engines driving the pumps will be placed in the basement and thus serve also to provide ventilation for this room. Air filters for the blower engines will be located on the outside of the building but the main air filters for the blowers will be installed on the main floor.

Blowers—The main blowers—two of 20,000 c.f.m. and two of 10,000 c.f.m. capacity—will be direct-connected to gas engines. Space is provided for the future installation of another 20,000 c.f.m. unit.

The present installation will provide air for the aeration tanks, air lifts and aerated channels. The installed working capacity with one unit out of service will provide about 1.35 cu. ft. of air per gallon of sewage; average aeration use is expected to be substantially less.

Both the pumps and blowers will

be driven by internal combustion engines which will normally use gas generated by the digestion of sludge. Since this fuel supply will be inadequate in quantity for the power required the digestor gas supply will be augmented by purchased gas. The heat values of both fuels are such that either or both may be used without engine adjustment. This feature provides a definite safety factor against a low supply of sludge gas and eliminates storage facilities.

The larger blower units will be driven by 800 hp. engines and the smaller units by 450 hp. engines. The total gas engine power installed will thus comprise eight units having a total of 3,500 hp. Future installations will increase this number to 10 units furnishing a total of 4,650 hp.

Heat recovered from the engine exhaust and cooling water systems, augmented as required by the plant boilers, will supply hot water for maintaining digestion tank temperatures and for heating the buildings.

Sewage from the larger part of the drainage area will reach the plant in a large sewer now under construction by the borough of Queens. The low-lying area east of the plant along Flushing Bay will be served by a separate intercepting sewer. The latter enters the plant at a low level pump well in the substructure of the pump and blower house from which it is pumped to the influent end of the grit chamber. The main trunk sewer also enters the plant by gravity at this point.

At the influent end of the grit chamber are hand-raked coarse screens or racks with 3-in. openings. Material from the coarse racks will probably be disposed of at a nearby refuse incinerator. The racks are followed by mechanically-cleaned bar screens with 1-in. openings. Screenings will be passed through a grinder and then returned to the sewage flow. It is estimated that the amount of screenings at the design flow (40 m.g.d.) will be 6 or 7 cu. yd. per day.

The grit chamber comprises two channels each 14 ft. in width, 7 ft. in depth and 60 ft. long, equipped with conveyor type collector mechanisms and grit washers. Velocity control is obtained with an effluent weir of the proportional type.

Washed grit will be discharged by a pneumatic ejector system to an elevated storage tank with a capacity of 150 cu. yd. On the basis of a daily recovery of from 10 to 15 cu. yd. of grit a storage capacity of from 3 to 15 days is provided. For the easy removal of grit by truck the tank is to be located adjacent to a roadway.

The discharge from the grit chambers flows directly to the main pump well in the lower substructure and from here is pumped to the primary tanks through a 54-in. force main. A venturi meter is installed in this force main.

Plant Highlights

Capacity: 40 m.g.d. present; 80 m.g.d. future.

Treatment: Activated sludge; sludge digested, thickened and barged to sea.

Byproduct Power: 8 gas engines, units producing 3,500 hp. Connected to pumps and blowers.

Area Served: Borough of Queens; drainage district includes 17,000 acres; ultimate population 550,000.

Cost: $4,100,000 (estimated).

Sedimentation and aeration

There are three primary sedimentation tanks rectangular in shape and equipped with conveyor type sludge collectors and scum removal mechanisms. The tanks are to be 124 ft. long by 50 ft. wide with a 12 ft. water depth. At average design flow a detention period of 1 hr. is provided.

Primary tank effluent passes over weirs into conduit leading to the aeration tanks. Two tanks are provided in the plant now under construction but space is provided for the addition of a third unit if operating results show its need. These tanks are to be 370 ft. long, 22.25 ft. in width and have a 15 ft. water depth; they will be of the spiral-flow type each with four channels.

One of the outstanding features of the plant is the provisions in the aeration tanks which permit primary tank effluent to be admitted in varying amounts at three points in the tanks. Return sludge, however, may be introduced only at the inlet end of the aeration tanks. This arrangement is intended to provide a distribution of load throughout the tank, permitting a higher loading, while at the same time maintaining the condition of activated sludge. Under this method of operation, there may be some reduction in the degree of purification.

Though a wide variation in the net detention period may be obtained when using multiple inlets, the detention period computed on the basis of the entire flow with 20 per cent return sludge under the usual method of operation will be above seven hours for the flow of 20 m.g.d. expected at the start. Results obtained during initial operation will determine the need for construction of the third aeration tank. For two tanks and the full plant design flow of 40 m.g.d., the detention period would be roughly 3.5 hr. or for three tanks, slightly over 5 hr.

Final sedimentation tanks

The aeration tank effluent flows through aerated distribution channels and over inlet weirs into the final sedimentation tanks. The four final tanks will be rectangular in shape, each 134 ft. long, 93 ft. wide with a 12 ft. water depth. These provide a detention period of 2.6 hr.

Adjustable effluent weirs extend longitudinally along the dividing walls of each tank from the effluent end to about the midway point. This length will permit the discharge of final effluent near what is believed to be the optimum section of the final tank to secure the best clarification.

Sludge from the final tanks is drawn by 4 air-lift pumps with a total capacity of 16 m.g.d. to sludge boxes located at the end of the gallery between the aeration tanks and the final tanks. Return sludge from these boxes flows through orifices to the distribution channel from which it enters the aeration tanks.

Raw sludge is to be withdrawn from the primary tank in 8-in. lines and pumped directly from the preliminary pumping station to the digestion tanks. Excess activated sludge will flow by gravity from the air-lift-sludge boxes to two sludge thickeners 21 ft. in diameter and 18 ft. deep. Chlorine is to be applied

to the contents of these tanks and the supernatant liquor will be discharged into the outfall sewer without further treatment. After the removal of a portion of the moisture in the thickener, this sludge will likewise be pumped to the digestion tanks.

There will be four digestion tanks each 83 ft. in diameter with a side depth of about 30 ft. and a conical bottom of approximately 9 ft. depth. They will be equipped with floating covers and will be heated by water circulated in four coils of 3-in. piping located in each tank just below the half-way point.

For computing tank capacity, the per capita contribution of solids was estimated at 0.26 lb. per day with a plant efficiency of 95 per cent overall removal of suspended solids. On this basis there is provided a volume of 176,000 cu. ft. in each tank or a total capacity of 705,000 cu. ft.

Gas production is estimated to be from 0.85 to 1.0 cu. ft. per capita and it is expected that this gas will analyze about 76 per cent methane and will contain 600 to 650 b.t.u. per cu. ft.

Supernatant liquor from the digestion tanks before being conveyed to the plant influent will be detained for about 6 hr. in a settling tank provided for this purpose.

Sludge storage and disposal

Digested sludge will be pumped to two elevated storage tanks located near the wharf. The tanks will be 35 ft. in dia. and about 30 ft. in height with conical bottoms of about 4 ft. depth. Lacking operating data it is estimated that sludge received at the storage tanks for final disposition will contain from 95 to 96 per cent moisture. It will however be retained in storage for 5 or 6 days and during this time it is anticipated that a further reduction in moisture will be obtained. Decanted liquor will be returned to the pump well for further treatment.

The total capacity of the two tanks will be slightly in excess of 55,000 cu. ft.—approximately equal to that of the 1,700-ton sludge vessels now under construction as a part of the Wards Island project. The operating schedule of the three vessels serving the Wards Island plant will also permit the handling of the Tallman's Island sludge. The vessels will be loaded by gravity from the storage tanks, and pumps are provided to clear the effluent lines after loading.

The disposal of sludge from this plant by barging to sea is considered to be the most economical method available. This is particularly true since the location of this plant on a body of water in close proximity to the Wards Island plant permits the use of excess or standby barge capacity provided for the latter plant.

The Tallman's Island project is being built by the New York City department of sanitation, under the direction of William F. Carey, commissioner. Walter D. Binger is deputy commissioner in charge of engineering; Richard H. Gould is chief engineer and Wm. L. Sylvester, assistant chief engineer. The project engineer is E. J. Fort and the resident engineer on construction is Alfred R. Glock.

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Cities Which Are Not Using Tax Maps Losing Thousands Yearly

ALTHOUGH real estate is always within view, cannot be removed, stolen or concealed, innumerable parcels are left off the assessment rolls, causing losses running into the thousands of dollars annually for many cities, according to a report issued by the National Association of Assessing Officers. The fixed quality of real estate leads to the erroneous belief that all of it, except that legally exempted, is assessed and taxed. But much property today goes unassessed and the reason is, in a phrase, "No tax maps."

Where accurate tax maps are not available, the assessor must rely on his memory and the previous year's assessment rolls, with results that are sometimes startling. The report not only points this out, but explains clearly how tax maps should be constructed and used to best advantage. Aerial tax maps are quickest and cheapest, but for a high degree of accuracy, especially where land values are highest, the ground survey is still recommended.

Aerial surveys

Aerial photography, a science that has made great strides within the last decade, is stated to be one of the most popular methods of tax mapping today. Under the direction of a professional aerial photographer, an airplane is flown back and forth in strips, similar to the course of a lawnmower, the camera shutter clicking at regular, specified intervals. The air-pictures are enlarged and used singly or combined into mosaics. Property lines are delineated upon the pictures to complete the property record.

Illustrating the evils where tax maps are non-existent and the benefits immediately arising when they are instituted, the report, entitled "Construction and Use of Tax Maps," offers some startling figures. For instance, East Haddam, Conn., built up its tax roll by 1,432 acres after completing an aerial tax map; Watertown, N. Y., discovered 100 parcels of land not previously assessed, valued at $77,600; Andover, Mass., found that an estate originally listed as 36 acres, from which 37 acres had been sold off in three transactions, actually contained 47 acres, 11 of them going unassessed for nearly a half century.

Copies of the report, which also explains in detail how tax maps may be secured, used and preserved, may be obtained from the National Association of Assessing Officers, 850 E. 58th St., Chicago, at 50 cents each.

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Preventing City Blight

THREE basic considerations are essential to prevent city blight, according to Thomas Adams, town planning consultant, as reported in *The Planners' Journal* of July-August:

(1) All land should be planned for its best economic use in the development of industry and for obtaining wholesome living conditions for the inhabitants;

(2) facilities for communication should be adequate to permit free circulation; and

(3) buildings and other structures should be well ordered, organically sound, pleasing in appearance, and above all surrounded by ample open space.

FIG. 1. WITH WPA AID HACKENSACK, N. J., BUILT THIS BUS TERMINAL.

A City Builds a Bus Terminal

Something new in municipal enterprise is the Hackensack, N. J. terminal, where bus lines and public are provided with modern transportation accommodations

To facilitate the movement of more than 800 buses through the city, and at the same time provide the public with convenient accommodations in the use of this form of transportation, Hackensack, N. J., recently built a union bus terminal. Opened last April, this city-owned-and-operated terminal is the first unit in a low-value district that will eventually be developed as a shopping center. Of particular interest has been the cooperative action of bus line operators with the city in voluntarily rearranging route schedules, and agreeing to pay a fee for the privilege of using the terminal.

Privately owned bus terminals have been built in a number of places, but only two cities—Hackensack, N. J., and Ithaca, N. Y.—are known to operate municipal terminals. In the latter place a central stopping point for buses was built in 1926 because of the acute traffic conditions in the concentrated business district of the town; elimination of bus stands on the main street greatly helped to relieve congestion.

Contrasted to the pioneer installation at Ithaca, which consists merely of two small buildings and a parking area, the Hackensack terminal incorporates features representing the latest practice in this type of design.

On a large plot of ground, adjoining which there is a free parking area accommodating about 400 cars, stands the terminal building; behind this are located the covered platforms where each of the 20 bus lines is provided with adequate space to take on and discharge passengers. City-employed attendants, who are prohibited from accepting gratuities, assist in parking cars and directing passengers. Special provisions have been made in a driveway at the front of the building for a taxicab sta-

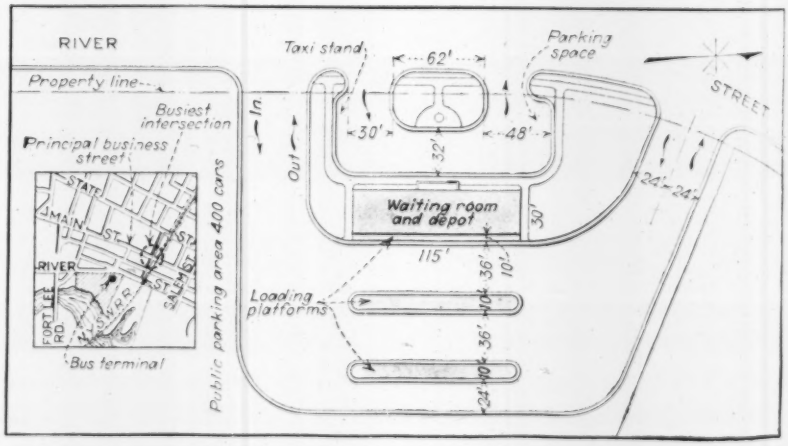

Fig. 2. Location plan and layout of the terminal facilities, which are within three blocks of the shopping center.

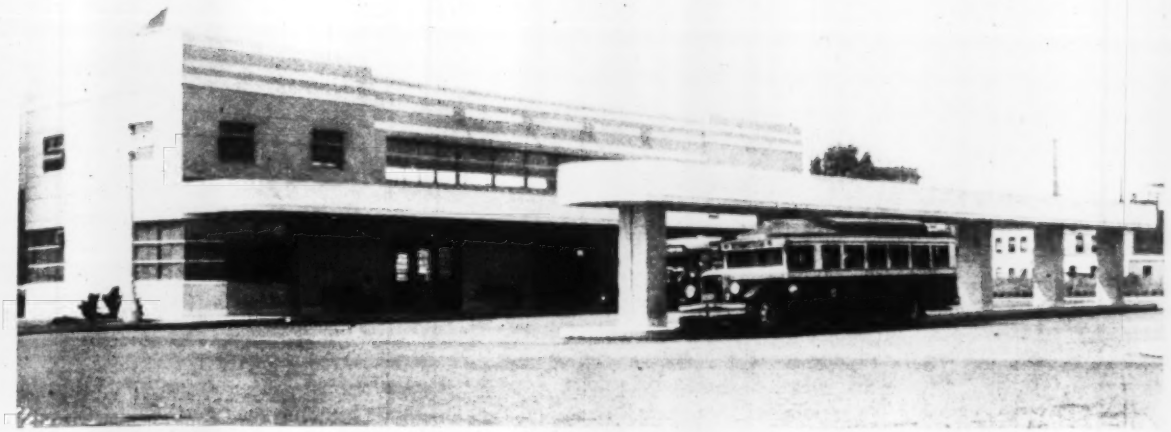

Fig. 3. Unloading platforms are located in a spacious plaza behind the terminal.

tion and for short-time parking to accommodate persons awaiting bus arrivals.

Credit for the Hackensack municipal terminal goes to city manager Wilder M. Rich. Coming to this city in 1933 when the council-manager form of government was adopted, he found, among other problems, the peculiar difficulties that affect "a one street town."

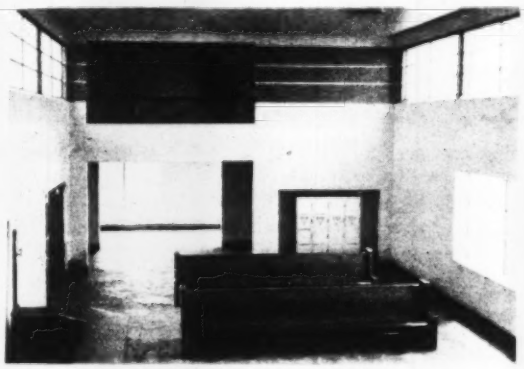

Fig. 4 Interior of the terminal looking toward a balcony lounge beneath which is located space for a concession.

Hackensack, a residential community of 28,000, is a county seat. Surrounded by small towns, it has become a shopping center catering to about 125,000 persons—and practically all the stores are on Main St. Traffic congestion starts in the early morning and by late afternoon the situation is chaotic. To alleviate this, a twofold approach suggested itself: (1) keep buses away from Main Street; and (2) encourage business growth to radiate away from this thoroughfare.

To accomplish these objectives, a central bus terminal was proposed. An ideal site was available—a large plot of undeveloped city-owned marsh land on the bank of the Hackensack River; less than three blocks from the heart of the shopping area, it possessed more advantages than merely nearness. Running by one side of it is a roadway (River St.) which not only bypasses the business section but connects with important streets in the city as well as with interurban thoroughfares at each end. And, in addition, the city owned several parcels of land near the proposed site, which would increase in value in proportion to improvements in the neighborhood.

Getting started

When River St. was paved in 1934, using men taken from relief rolls for which the city was reimbursed by the state, the idea of a bus terminal took definite form. The plan was not advocated at that time, however, because the city treasury was depleted by the unprecedented depression demands.

When WPA aid became available a year and a half later the bus terminal project was advanced. Its many civic advantages won public support and the city council authorized an application for federal funds. Approval made it possible to start construction in February, 1936.

Bus companies had been approached before actual construction began and while no definite operating arrangements were made, all the interested companies advised that they would use the terminal. It was then necessary to obtain cooperative action in laying out new routes and agree on a fee to help defray operating expenses.

Although this was a matter depending entirely on voluntary acquiescence and in some cases involved the interests of competitive lines, a remarkable demonstration of friendly cooperation was forthcoming. Of the 800 buses representing 20 lines which operate through the city on interstate, interurban and local business, 675 were re-routed to the terminal. One interstate company could not change its station because of a previous contract with a private party, an interurban express service line had no need for stopover facilities, and three short local lines were not interested because they maintained runs some distance from the terminal.

The procedure in changing the routing, according to public utility commission regulations in New Jersey, was as follows: the city council passed resolutions permitting individual route changes, these were signed by the bus company and then voluntarily submitted to the commission, which eventually will take action. Since this action of approval requires several months, the city was empowered to invoke police powers

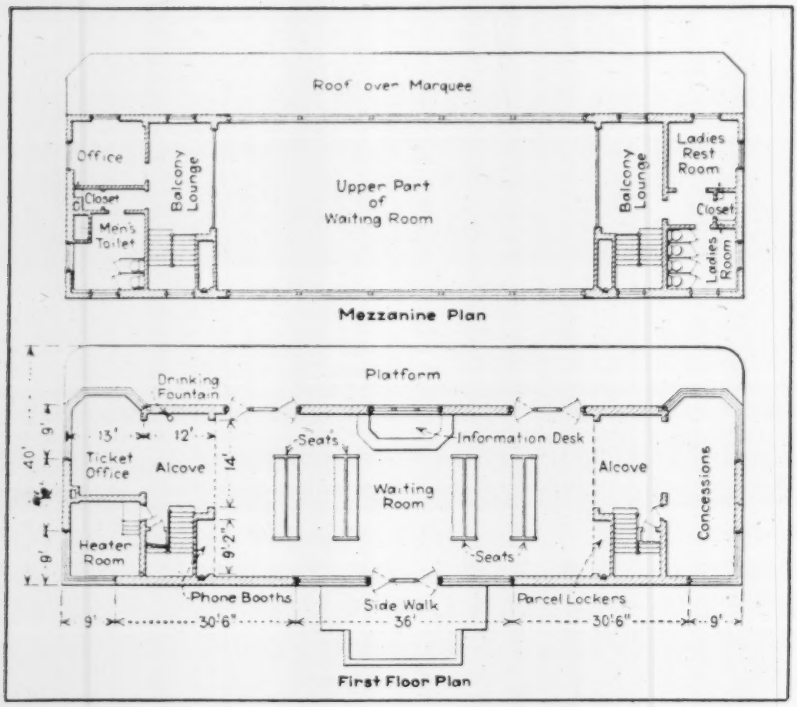

Fig. 4. Design of the terminal building provides generous waiting room space and convenient accommodations for the traveler.

of a municipality and thus make immediate temporary changes in routing of the bus lines which come into the plan.

Terminal design features

The terminal building itself, of simple but pleasing modernistic architecture (Fig. 1), is a steel, concrete and brick structure 115 x 30 ft., and 27 ft. high. Set well back from the street, and flanked on either side by entry and exit driveways, it faces a parkway street leading to the central shopping district.

In the rear of the building are the loading platforms, built of concrete with overhead canopies also of concrete construction. Each platform will accomodate six of the largest buses at one time. Parallel parking is used, not only to facilitate the departure of buses, but also as an added feature of safety not possible with diagonal parking.

The building layout (Fig. 4) provides a generous central waiting room, two stories in height, at each end of which are balcony floors. On these floors are located a rest room, toilets and comfortable lounges, the latter overlooking the waiting room. Below the balconies and on the main floor are spaces for concessions and a ticket booth. Also on this floor are an information desk, telephone and telegraph facilities and parcel lockers.

It costs money—estimated at $9,000 a year—to operate the terminal. To help defray expenses the bus companies are charged on the basis of 50 cents per month per bus; this is estimated to return $4,000 annually. The concession, which includes a luncheonette, tobacco and periodical stand, is expected to produce about $3,000 a year. With other income estimated at $1,200 the total yearly revenue will be about $8,200, leaving an annual loss of some $800 to be absorbed by the city.

Operating cost does not include principal and interest charges on the bonds, however, and these, too, will be retired by appropriations included in the regular yearly budget. This procedure is based on the principle that the bus terminal confers a general benefit upon the people of the city of Hackensack.

Initial costs

Experience during the first three months shows an average operating cost of $706 per month against an income of $475. A net loss of $231 a month, therefore, has been sustained thus far. Principal justification for present losses is the likely realization of more than a quarter million dollars of profit on increased value of city real estate holdings within the next five years.

The Hackensack terminal project, costing $79,000, was built with the aid of a $47,000 allotment from WPA, under the direction of Wilder M. Rich, city manager. The architect on this work was D. Spencer Newman of Hackensack.

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Cleveland Arena Floor To Be Laid in One Operation

SPECIFICATIONS for laying the 16,548 sq.-ft. monolithic concrete and terrazzo floor for the Cleveland Hockey Club's new sports arena, under construction by The Gillmore, Carmichael, Olson Co., Cleveland, call for laying the terrazzo top within 30 minutes of the concrete base. The concrete, in which 9.7 miles of refrigeration pipe will be imbedded, will be poured in one continuous operation, the entire job to be completed in less than 36 hours.

The 6-inch monolithic slab, with expansion and contraction movement of 1½-in., to take care of 30 deg. temperature changes, will float on slip-plates of sheet zinc bonded to the concrete by natural chemical action. The slab will rest on a 4-in. layer of rock cork insulation, separated from it by asbestos paper and waterproofing. Longitudinal reinforcement will consist of rods while the transverse reinforcement will be furnished by the 1¼-in. dia. refrigeration pipes. All joints will be welded.

The unique construction of the refrigeration system in a terrazzo topped concrete floor, will make possible the use of the arena for such events as conventions, dances, lectures, and basketball games. The changeover from ice rink to auditorium floor will be accomplished by turning off the refrigeration system and sweeping the melting ice into a steam-heated pit at the end. The floor is constructed under M. B. Carpenter patents. Warner & Mitchell, Cleveland architects designed the building. Robert T. Callaghan is consulting engineer.

Twenty Years of Zoning

by HARLAND BARTHOLOMEW
City Planner, St. Louis

An appraisal of the benefits and shortcomings of zoning, explaining why it has enjoyed its greatest success in the small cities

THE POWER to regulate the use of private land and the nature of buildings constructed upon it extended the jurisdiction of American cities far beyond any previously known precedents. Has this power been wisely used? Has its use been justified? What has been its effect upon private property? Since most cities have adopted zoning ordinances within the past twenty years, it should be possible to answer these questions at this time, although the most exhaustive research would probably fail to reveal the full effect of zoning upon cities and upon private property.

It was claimed that zoning would preserve residential districts from harmful invasions, that it would stabilize property values, prevent overcrowding of population, reduce congestion in the public streets, and permit a more orderly arrangement of cities. Opponents contended that it would confiscate private property and ossify the cities. Uncertainty of the legal status of zoning caused frequent debate during the early years. This uncertainty, as will be discussed below, had considerable effect upon certain standards of practice.

Since the decision of the U. S. Supreme Court in the Euclid Village case upholding the constitutionality of zoning, little has been said by its advocates, possibly in the belief that their cause is established and there is no need of further debate. In recent years, however, there has been much criticism of zoning practices, some adverse court decisions, as well as a growing feeling that zoning has not accomplished all that was expected.

A fair appraisal of the situation today indicates that: (1) Zoning has been most successful in smaller cities and in suburban communities; (2) the objectives of zoning have not been achieved with any degree of success in the large cities; and (3) the effect of zoning on private property has been beneficial generally, but harmful in certain instances.

Zoning was undertaken in many cities before the preparation of a comprehensive city plan, chiefly as a means of protecting residential areas from inharmonious uses. Such zoning does not bring about a well-balanced development of the whole city. Most zoning, even though comprehensive in nature and fully coordinated with a carefully prepared city plan, was undertaken without a a full and complete knowledge of urban land characteristics. Any judgment of zoning today must give due consideration to these facts. Our cities have not yet realized the full implications of zoning. Some cities have recently undertaken revisions of early zoning plans in an endeavor to apply more scientific standards and further development of practice is to be expected as our cities emerge from the effects of the depression.

Successful in small cities

Cities of less than 75,000 population have benefitted most by zoning. Kenosha, Wisc., affords an excellent example of the successful use of zoning power. In this city zoning was undertaken as part of a comprehensive city plan. Compared with twenty years ago the city is now a better balanced, as well as a more unified community, and property values are fully as sound, if not sounder, in all parts of the city area.

There is no pronounced blight caused by shifting of population or of business and industry. Low population density regulations have prevented over-crowding of population, and thus have aided in the preservation of older residence districts. By the establishment of building lines on major streets, including "vision clearance" at all street intersections, public safety has been promoted, and there will be great public economy whenever street widening is needed. Population density regulations make possible more economical installations than formerly of such things as water mains, sewers, pavements, transit facilities and schools.

The entire administrative functions of the city are based upon known policy rather than upon the uncertainties of haphazard drift in the growth and development of the urban area. Kenosha officials are not given to unjustified amendment of zoning regulations at the request of individuals seeking special advantage. The citizens generally accept and willingly abide by the regulations. There have been few changes in regulations, and almost no lawsuits. The city has grown in population and in economic strength. A few years ago it received first award in a state-wide "better cities" contest.

What is true of the effect of zoning in Kenosha is true in varying degree in many other cities of less than 100,000 population. Some have prepared their zoning carefully and administered it wisely, and some have not. Experiences to date indicate, however, that zoning is used with advantage today in most cities of this size and with genuine benefit to owners of the land.

In the residential suburbs of metropolitan areas zoning has had its most beneficial effect. In Winnetka, Ill., and Webster Groves, Mo., to cite but two of many examples, there has been considerable growth, but the very large single-family residence areas have been maintained intact and property values have been stabilized if not enhanced. In Webster Groves the zoning ordinance has recently been revised by increasing

the requirements for yards and open spaces and by increasing the lot area per family regulations in order to conform more closely with established standards and to preserve a good character of future development.

Despite the more restrictive character of suburban zoning requirements, it is quite significant to observe that the first and almost the only revival of real estate activity in metropolitan communities since the depression is in the suburban communities. The protective features of zoning which are not subject to frequent and easy change and which insure a high standard of development are appreciated to such an extent by the general public that the effect has become evident in the real estate market.

The case of large cities

In the larger cities, zoning has not stabilized the growth of the city as a whole nor has it prevented overcrowding of land, reduced congestion in the streets or stabilized land values, except in outlying areas. The great body of urban area which was built up before zoning ordinances were adopted remains unaffected or is in a less satisfactory condition than formerly.

Zoning is regulatory in nature. It is not a constructive force, *per se*. Zoning is directive and protective, and hence highly effective where new growth takes place, such as in an unspoiled community or at the edges of large cities and in suburban cities. It is futile to assume that zoning will cause immediate or even ultimate reconstruction of large cities, or that it can always arrest improper trends. The unfortunate fact is that large cities were so badly unbalanced and property uses were so mixed throughout much of their area that zoning could not change the condition. Zoning came in time to prevent occurrence of such conditions in the smaller places, but it came too late for this in large cities. If ever our large cities are reconstructed, zoning of a truly comprehensive nature will be of inestimable value.

Zoning has failed for the most part in large cities because regulations are based upon established standards and not upon a comprehensive plan of good standards. Established standards of land use and building development in large cities are, for the most part, based upon policies of speculation and exploitation rather than upon conscious design for good order, good health, economy and amenity. The process of bringing about an orderly method of development in large cities—where for a century an opposite policy has been followed—is no simple task. Twenty years is a short time in the life of a city and too much must not be expected of any change in policy, especially a policy

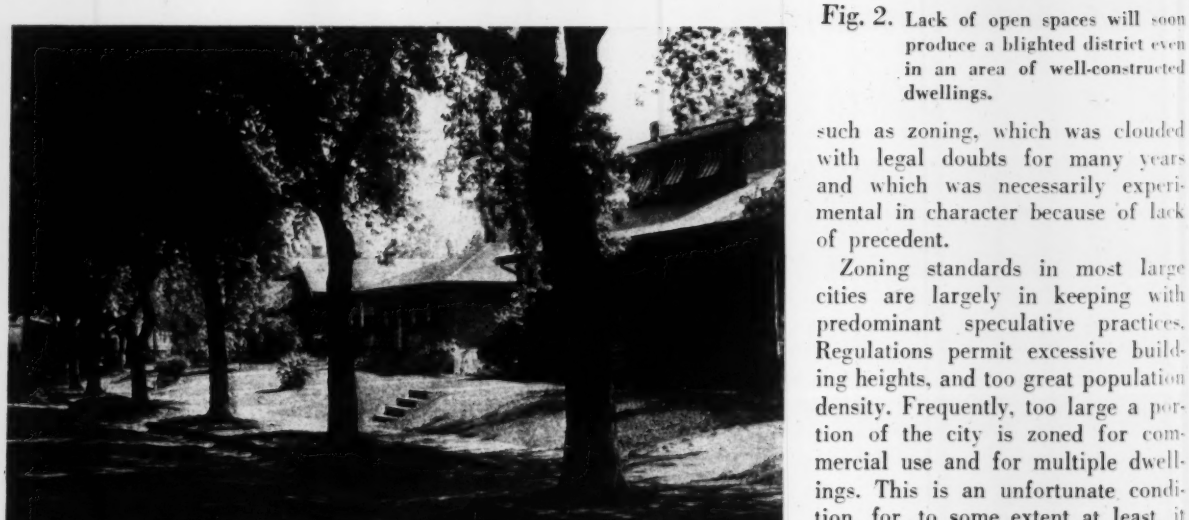

Fig. 2. Lack of open spaces will soon produce a blighted district even in an area of well-constructed dwellings.

Fig. 1. Sound zoning leads to well-planned subdivisions which retain their character and encourage new construction.

such as zoning, which was clouded with legal doubts for many years and which was necessarily experimental in character because of lack of precedent.

Zoning standards in most large cities are largely in keeping with predominant speculative practices. Regulations permit excessive building heights, and too great population density. Frequently, too large a portion of the city is zoned for commercial use and for multiple dwellings. This is an unfortunate condition, for, to some extent at least, it injures rather than benefits all property zoned improperly.

There were very good reasons,

however, for this early zoning. First, there was no knowledge of the total amount of land which could be absorbed for different uses by given units of population. Only recently has there been developed such a body of data. Secondly, there were exaggerated ideas of growth of population in large cities which even seven years of depression have not fully dispelled. Thirdly, public opinion would not have supported zoning regulations out of harmony with established practices. And finally, state zoning enabling acts provided that zoning plans should "be made with reasonable consideration to the district and its peculiar suitability for particular purposes." This provision was interpreted generally to mean that existing conditions and trends at the time zoning was adopted should determine the character of zoning in various parts of local areas.

Fig. 4. Decadent property near business centers has no future unless a definite land policy for the whole city is determined and zoning ordinances are adopted.

Fig. 3. Stores in a residential district which is properly zoned can be made unobtrusive and they are not detrimental to the neighborhood.

Maladjustment of city growth being as great as it was, however, it is evident now that of far greater import are those provisions of the zoning statutes which state, "regulations shall be made in accordance with a comprehensive plan. . ." To make a comprehensive zoning plan that will lessen congestion in the streets, prevent the overcrowding of land, and bring about the most appropriate use of all land throughout all parts of any large city, is indeed a major undertaking. It would cross so many speculative interests that its enactment would be an open question in many cities.

Zoning has not failed completely in the large cities. It has protected new developments on the outskirts, as previously stated, and it has probably retarded some decentralization, thus arresting the accelerated spread of blighted areas in most large cities. To the extent that zoning has brought about a recognition of the present hopelessness of some of the old areas, and has arrested further depreciation of other such areas, the charge of ossification might be debatable. In any such discussion, however, a sharp distinction would have to be made between total values based on permanent best use of land and the end result of all speculative values, for the latter are frequently of a temporary nature, and often are accompanied by losses in adjoining or adjacent property.

Consider these factors

Although zoning is unsatisfactory in most large cities, the serious plight of property in so much of the older centrally located sections of these cities is not chargeable to zoning. Long before zoning came into use our large cities had laid the foundation for present decentralization. What are the reasons for population drifting away from the older central areas? And why are centrally located business districts losing commercial tenants to suburban business centers? There are many causes for these vast changes in the structure of the large city, foremost among which are: (1). Automobile transportation; (2). obsolete houses; (3). unattractive environment; and (4). high land values.

The automobile has changed the scale of the city. Street car transportation had an effective radius of five miles, and two decades ago the great mass of population in many large cities was found within a smaller radius. The automobile has

increased the effective radius of urbanization to twelve or fifteen miles. This necessitates a vast transformation in land use, especially where there is no corresponding increase in total population. Farm lands at the edges of cities are increased in value while land in the older sections of the cities is subject to considerable loss. Because of increased distance of travel, it is inevitable that there be a certain amount of decentralization of business and of industry. There need not be complete decentralization, however.

Suburban areas attractive

Suburban areas, now quickly accessible to large numbers of people, are especially attractive because the houses are new and contain modern conveniences, while the environment is far more attractive. Therefore, why should not people move out of the older areas of large cities?

A case at hand is that in St. Louis, where surveys disclosed a loss of 100,000 population between Jefferson Avenue and the Mississippi River, which is within the first one and one-half mile zone. Residential vacancies within this area averaged 22 per cent as compared with 7 per cent in the whole city three years ago. From one-third to one-half of the population which remained expressed a desire to move at the earliest opportunity because they wanted better living conditions and an improved environment. Those who expected to remain gave as their reasons proximity to work and old associations. Further decentralization of commerce and industry would still further depopulate these areas.

Obsolete houses and an unattractive environment will cause people to leave any area if better facilities can be found elsewhere at commensurate prices. Yet the older areas are far more conveniently situated and they possess all requisite public services. But unless they can be made wholesome and attractive at reasonable cost it is not to be expected that the population will remain or that new population can be attracted to them.

All city growth in the United States to date has been by outward expansion at the edges of the urban area. It is an expensive process if carried on indefinitely, and especially so when done at the expense of the older areas. We have not learned how to reconstruct old areas successfully. We have not even learned how to maintain good conditions in residential areas once completely built up. American cities must soon adopt sound urban land policies if they are to survive.

These are matters which run deeper than zoning. But if there is a comprehensive city and regional plan, with careful arrangement of population distribution and density, and adequate provision for slum clearance, and particularly for rehabilitation of blighted districts, the zoning regulations will be a desirable and most effective supplement. The zoning must be synthesized with comprehensive planning. Zoning alone cannot be expected to bring about comprehensive rebuilding of the larger cities.

Zoning and private property

In small cities, property values are fairly stable. Zoning has increased their stability. In large metropolitan cities and their suburbs property values are much less stable because of extensive speculation. Zoning has stabilized land values in most suburban communities, particularly those devoted predominantly to single-family dwellings.

Industrial property values are not generally affected by zoning. If there were undue curtailment of industrial area by zoning, the condition would be reflected in higher prices for industrial property, but no such condition has ever come to public notice.

The two chief speculations in city real estate are retail store property and multiple dwelling (apartment) property. Only one or two instances have occurred where the *total* amount of land zoned for these two purposes in a city was so restricted as to cause an inflation of values. However, since stores and apartments have long been in the habit of invading single-family dwelling districts, or at least encroaching upon them, and since zoning generally arrests such invasion, it has often been difficult to draw the dividing line at the time of adoption of zoning plans. Since few cities or parts of cities are designed to effect natural separation between single-family dwelling, apartment and commercial property there is bound to be some difference of opinion as to what is the logical zoning on certain property. Speculation proceeds well in advance of actual use and where dividing lines are drawn, as they must be when zoning is adopted, some of the earlier purchasers are certain to be "injured," although much of their "loss" consists of uncollected unearned increment.

Because our habit is to abandon old residence areas in favor of new suburban development, large areas of old property are left without much hope of future usefulness. There is insufficient commerce or industry to absorb them. Certain long time owners of such residential property frequently feel that as their neighborhood becomes older and less desirable they should be permitted to sell for any type of property use not actually a nuisance *per se*. The contention usually is that "it will not hurt anything." When zoning interferes with such sale of property the claim is made that it "confiscates" value.

This, however, is not the whole story. If zoning in such instances merely prevents further decadence it is justified as a stop-gap pending the time when cities can adopt constructive urban land policies. There is no actual loss of value because of inability to resell for some other purpose. The real loss in value is due to neighborhood deterioration. This cannot be overcome by change of land use except in very limited degree.

If zoning prevents invasion of single-family dwelling areas by apartment or commercial uses, the values conserved exceed any temporary speculative values that might be created by the change. In a very limited number of instances an exception to this statement might be justified if it can be proved that a change is really needed and there are no other areas available in the zoning plan for the accomodation of the use desired. Such proof is rarely found.

Property has value only so long as there is demand for it. When supply far exceeds demand, prices fall. Zoning is effective in small cities because supply does not far exceed demand and there is less speculation in commercial and apartment property. Zoning would be more effective

in the large cities if it were more realistic—more in scale with actual supply and demand. In the large cities, far more area has been zoned for apartments and for commerce than can ever be absorbed. Such zoning has not produced greater values. Where there is no zoning, or zoning which is out of scale with genuine need, there may be created a few temporary speculative values, but in the long run there will be almost total loss of value if the land use is not based on sound demand. These facts must be taken into account when considering the effect of zoning on private property. Single cases or groups of cases are not proof conclusive. It is the sum total of profits and losses that must be weighed—of true value as opposed to purely speculative value.

Where zoning falls down

Under certain circumstances zoning may be harmful to private property. For instance, in a district zoned for commercial purposes, an oil company paid a high price for a corner lot on which stood a single-family dwelling. After partial dismantling of the building the owners of residences on the side street petitioned the city council to change the zoning from commercial to residential. This the council did, and subsequently the courts sustained the residential zoning. The owner suffered a considerable loss through no improper action on his part.

In another case an owner built a substantial house on a corner lot zoned as residential. Subsequently the city council zoned one of the intersecting streets for commercial use, including the corner lot with the large new dwelling. This owner sustained a substantial loss through no improper action of his own. Both cases are examples of improper original zoning. These are exceptional, perhaps, but their occurrence occasionally gives rise to justifiable criticism of zoning. The more complete and comprehensive is the zoning plan, the less will be the injurious effect upon private property as illustrated by such examples as these.

One of the most unfortunate practices in zoning is that of random changes sometimes referred to as "spot" zoning. It has no justification, for it is contrary to the requirement of a comprehensive plan specified by the zoning enabling act. It is vicious in principle, is injurious to surrounding property, and really penalizes the owner who builds in accordance with the zoning regulations. City councils in large cities appear to give more consideration to individual seekers of zoning changes than to the maintenance of a comprehensive plan. This is because the council usually has little conception of the full significance of the comprehensive plan. A glaring example of this was the statement of a circuit judge in a large city, who objected to introduction of testimony about studies of the whole city that preceded enactment of the zoning, for he "was only trying the zoning on this particular lot (in litigation)." When provisions of the state zoning enabling act were read he saw for the first time the purpose of zoning and he upheld the provisions of the ordinance. City planning and zoning commissions are not sufficiently vigorous in upholding the principle of a comprehensive zoning plan. Present zoning in large cities is frequently insufficiently comprehensive to establish clear objectives in the minds of council members or of citizens.

Powers of appeal boards

One other practice which tends to injure private property is the action of boards of appeal in granting variations to zoning regulations that are in effect little more than a waiver of such regulation. Boards of appeal have no such authority, but many of them exercise it. The powers of such boards should be carefully circumscribed and limited to cases of definitely proven hardship and deprivation of use. The courts have been careful to make such distinctions. Unfortunately, in many of our cities the original principles and purposes of zoning have been forgotten, and the same policy of *laissez-faire* which led to the blighting of so much property in large cities has crept into zoning practice through unwarranted actions by boards of appeal and through "spot" zoning changes. Lack of a well-defined comprehensive plan also has a bearing upon this situation.

These instances of property unfortunately or injuriously affected by zoning are confined for the most part to large cities. By and large, zoning has benefitted private property despite the unfortunate practices. These will be corrected as public understanding is increased or as public administration increases in effectiveness. If they are not corrected, our large cities will be faced with ultimate collapse. They must be made sound in all parts of their area, and not merely at the edges as new building takes place. Decadence at the center must be corrected or, like a cancer, it will consume the strength and vitality of the whole structure.

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Seepage From Reservoir Traced to Earthquake

COMPLAINTS made by residents in the neighborhood of the San Pedro Reservoir in Los Angeles that water was seeping into their basements led to the discovery of a crack in the bottom extending the full length of the reservoir. Test holes drilled around the reservoir showed that the ground was saturated with water. The engineers concluded that the crack probably resulted from the 1933 earthquake. The bottom contained many small cracks as the concrete was not reinforced.

As reported in the recently issued annual report of the Board of Water and Power Commissioner, repairs were mads as follows: The major crack and all serious other cracks were cut out and filled with concrete. The bottom was then paved with 2-in. of flexible asphalt concrete containing only fine aggregate. All wall cracks, which were not large in number, were repaired by the Aquatite process. Tests after refilling showed only a small amount of leakage.

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Bridge for Sale

THE steel and timber railway bridge erected by the Army engineers across the Missouri River at Fort Peck Dam, completed in 1934, has now served its purpose—the dumping of more than 8,000,000 tons of fill for the downstream toe of the dam—and is to be sold to the highest bidder.

Bids on the bridge trusses and girders will be opened at the office of the district engineer Oct. 12.

Streets of Tomorrow

by S. JOHANNESON
Seagirt, N. J.

A vision of ideal traffic routes for the city not yet built translated into workable plans for the cities we have built

FOR HIGHWAYS in the open country, the general method of design has been rather well developed. The highway is located on a new right-of-way of proper width, and access to it is at few and definite points only; the highway is divided into two roadways carrying traffic in opposite directions, and separate roadways may be provided for trucks and passenger cars; intersecting roads are carried over or under the highway, and at junction points grade crossing of traffic is avoided by the introduction of clover-leafs, traffic circles or other suitable construction.

In cities, the problem is different, principally because the right-of-way necessary for adequate highway improvements is not so readily available. The main streets of most cities and towns were laid out at a time when the present development of vehicle traffic could not have been imagined, and for that reason they are now congested with traffic and will be entirely inadequate in the near future, unless radical improvements are made. To make room for these improvements, it will rarely be possible to demolish large parts of the buildings of the city; other means, therefore, must be attempted. To see what these means should be, it may be worth while to dream of how the traffic routes should be arranged in a city not yet built.

An ideal system

Within the business district this city may be of the usual block pattern with two systems of parallel streets running at right angles to each other. The streets will be at least 100 ft. wide, and the corners of the city blocks will be rounded for easy turns at intersecting streets. The roadway will occupy almost the full width of the street, and the sidewalks will be at the second story level of the buildings. Paralleling the streets, but on separate rights-of-way through the middle of the blocks and about one-half mile apart, viaducts will carry the through traffic without interference with the local traf-

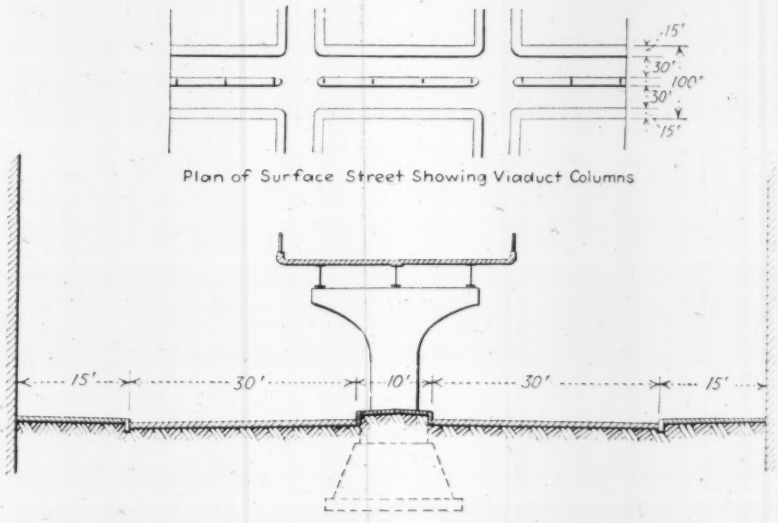

Fig. 1. Two-level roadways offer a reasonable way out of the difficulties of city street traffic congestion.

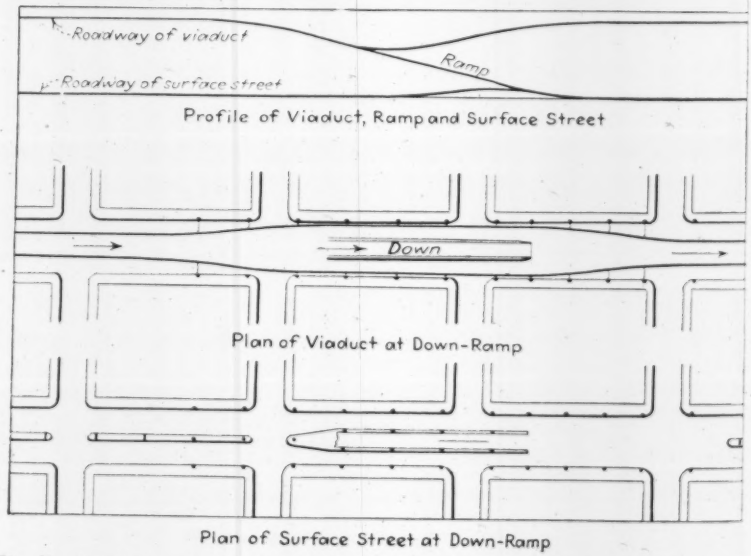

Fig. 2. Simple ramp system provides all needed traffic interchange between two roadway levels for city streets.

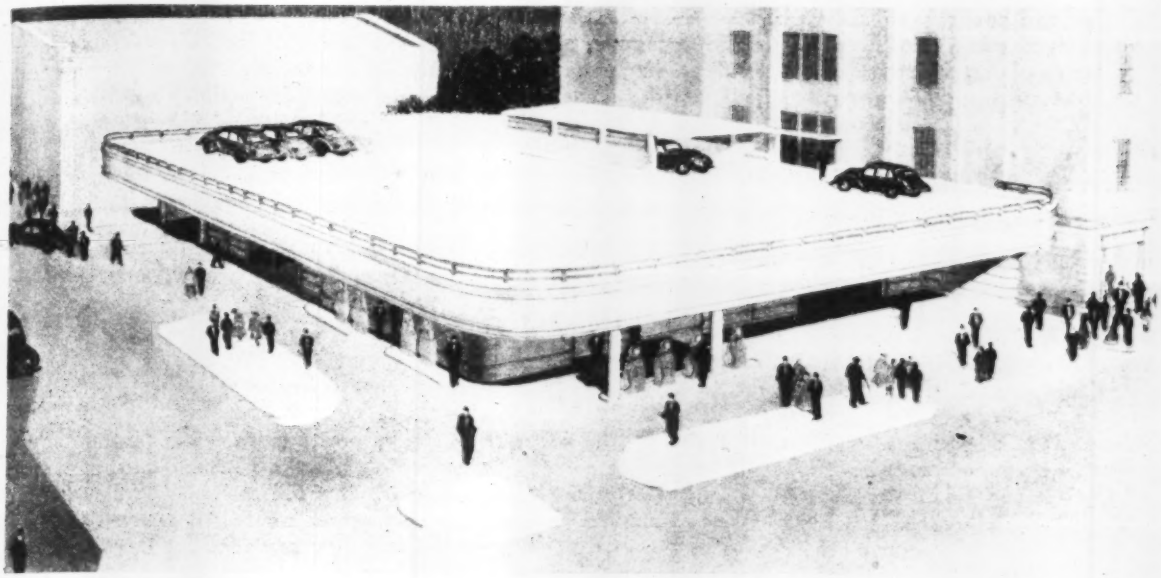

Fig. 3. Parking areas on the roofs of structures, already an accepted practice, will do much to relieve traffic congestion.

fic, and ramps will connect the viaducts with the surface streets. The street level of the viaducts will be used for parking cars, and the subsurface level for rapid transit passenger subways. Loading and unloading of trucks will be arranged for at places outside of the street area, and all streets will carry one-way traffic only, unless they have a divided roadway. In residential districts the main highways will be carried through as in the open country. The local highways for vehicle traffic will be separated from the pedestrian walks, and the two classes of traffic will have no grade crossings.

The city is not static

We may dream of how the ideal city should be built, but we realize that neither this nor any other city will remain stationary. A city is a living thing that grows, ages and regenerates according to necessities, opportunities and fashions in complete disregard of preconceived ideas. In planning a city we can do little more than take care of the immediate problems and provide sufficient public space for future developments and improvements. We can, however, in an existing town or city, attempt to apply some of the ideals, at least in a modified form, for the purpose of improving the conditions of traffic.

In the ideal city all the streets carried one-way traffic only or had divided roadways in the business part of the city. One of the main advantages of one-way traffic is the resultant reduction of interference at intersecting streets. At an intersection of two streets, both carrying two-way traffic, there are 12 possible simultaneous movements of the vehicle traffic; at a crossing of a two-way and a one-way street the movements are reduced to 7; and if both are one-way streets there are only 4 possible simultaneous movements. It is evident that the interference is least at the crossing of two one-way streets and, consequently, that the delay and danger to vehicular and pedestrian traffic is at a minimum at this type of crossing.

There is, however, an objection to one-way streets that should not be overlooked. The presence of one-way streets compels a large part of the vehicles to travel excess distances to reach their destinations, tending to add to the congestion in the streets, and for that reason it may be better to provide divided roadways in streets that are wide enough. A divided roadway has most of the advantages of a one-way street, providing the center island can be made of sufficient width, but even a comparatively narrow island is likely to improve the speed and safety of travel. For the improvement of traffic conditions in an existing city it is not possible to suggest generally whether or not all the streets should carry one-way traffic only. In each particular case it is necessary to weigh the advantages and disadvantages before reaching a conclusion.

Parking and loading

The ideal city had arrangements for parking cars and for loading and unloading trucks outside of the street areas. If we could find a satisfactory method of doing this in an existing city, we would probably not have to consider other means of improvement for many years to come. The fact is, however, that in the congested parts of most cities there are no places readily available for parking or for loading and unloading trucks, except within the street area. Some business concerns have found it to their advantage to provide loading space within their building sites; many-storied municipal garages may be erected in some cities, and the building laws may be amended to require that all new buildings within the business zone shall have ample space for loading and parking, but it would take many years before such improvements would have a material effect on the congestion in the streets.

The ideal city had special roadways for through traffic, carried on viaducts on separate rights-of-way through the middle of the city blocks. In an existing city it is rarely possible to follow this arrangement, but if some of the existing streets are wide enough, the through traffic may be carried on a viaduct, built in the middle of such streets. The necessity

for additional roadways to take care of the ever increasing traffic, to promote saving of time and to reduce the number of accidents may compel the construction of such viaducts, even though most people might prefer that conditions were such that we could do without them.

In a 100-ft. wide street the construction of the viaduct may be as shown in Fig. 1. Each of the sidewalks is 15 ft. wide, leaving a distance of 70 ft. between their curbs. The roadway is divided by a 10 ft. wide center island into two roadways, each 30 ft. wide, sufficient for three lanes of traffic on each roadway. The viaduct is supported on a single row of piers, placed within the area of the center island. The piers are bracketed on both sides to provide supports for the three stringers carrying the roadway slab. The roadway of the viaduct is 30 ft. wide and is protected by curbs of sufficient height and strength.

In a street where the city blocks are 200 ft. in length and the cross streets are 60 ft. wide, the piers may be spaced 65 ft. centers, which spacing will permit the use of rolled beams for stringers. The piers may be of steel or concrete and must, of course, be properly anchored to adequate foundations.

Ramps and sidewalks

Connections to the surface street may be made as shown in Fig. 2. At the location of the connection the viaduct structure is widened and the three-lane roadway is divided into two two-lane roadways so as to provide space between them for a two-lane ramp connection. The ramp shown will permit vehicles to descend from the viaduct, and similar ramps must be provided to carry vehicles from the street to the viaduct. If the alternate up- and down-ramps were spaced $\frac{3}{4}$ mi. apart, the distance between two up-ramps or down-ramps would be $1\frac{1}{2}$ mi., and this probably would provide adequate service.

If the length of the city blocks is less than 400 ft., the ramp structure will interfere with direct passage of traffic through one of the cross streets, as will be seen in Fig. 2, and this traffic, therefore, must detour two blocks, unless some other arrangements may be made. By judicious selection of the site of the ramp connection, however, it may be possible to locate it at a cross street with little traffic, or at a place where an underpass may readily be constructed, or where some other suitable means may be devised for avoiding the obstruction.

Finally, in the ideal city the sidewalks were at the second story level. To introduce such sidewalks in an existing city would require material remodeling of the adjacent buildings, and for that reason this improvement will undoubtedly be deferred as long as possible; nevertheless, it is quite within the probabilities that the traffic congestion may compel their construction before many years have past, and the beginning is likely to be made in some of the narrower business streets.

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Steel Containers and Cranes Used For Handling Rubbish

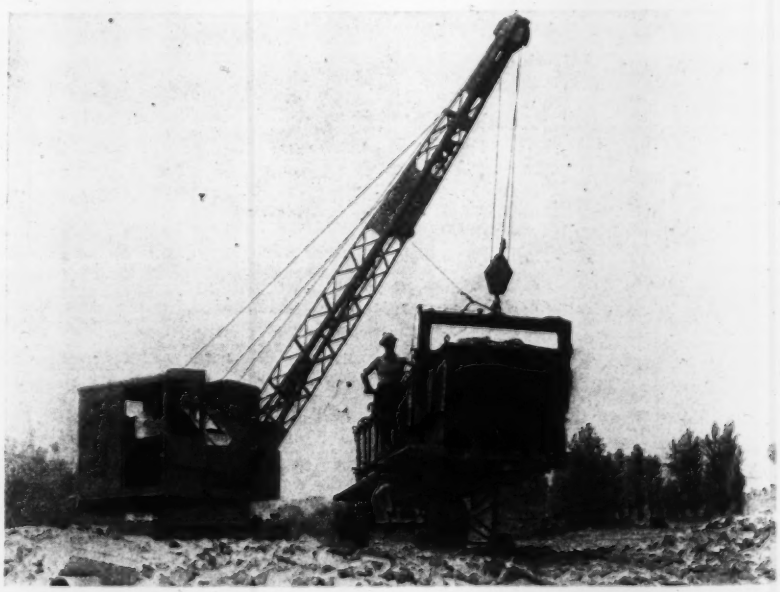
COMBINING the old with the new, the system of collecting ashes, rubbish, and street dirt in one section of West Philadelphia, involves the use of horse-drawn carts fitted with removable steel containers, in conjunction with tractor trailers and cranes.

The steel containers, with a capacity of 3.1 cu.yd. are fitted into a steel frame on a cart drawn by one horse. The top of the container when in position, is about 5 ft. above the curb. Each container is fitted with a canvas cover.

When the carts leave the district plant each morning, they carry an empty container and proceed to the designated route to begin work for the day. While the carts are being loaded, tractor-driven trailers are placed at designated transfer points along the route. Each trailer is fitted with six empty containers. Loaded carts are driven to the transfer points where a wheel-mounted crane moves the full container to the trailer and then replaces it with an empty one. The cart then continues with collections.

When six loaded containers have been placed on the trailer, the tractor is attached and it is taken to the dump. Here a crane of the caterpillar type with a bail attachment, removes the containers and empties them. Empty containers are then placed on a trailer which proceeds to the transfer point on the route where the initial operation is repeated. As the work progresses, the street crane moves between transfer points.

The operation described herein is based on information received from Dudley T. Corning, acting chief of the Bureau of street cleaning, Philadelphia, Pa.



Rubbish-filled steel containers are brought to the dump on tractor-driven trailers where they are emptied by a crane fitted with a bail device.

Charting a Safe Financial Course

There is no formula for depression-proof finance, but the observance of a few simple principles will make cities less vulnerable to economic disaster

Uppermost in the minds of municipal officials is the problem of establishing sound financial policies to prevent the recurrence of depression-born difficulties. Wise counsel in this matter comes from Frederick L. Bird, director of municipal research, Dun & Bradstreet, Inc., who spoke before the Governmental Research Association meeting in Ithaca, N. Y. on Sept. 2. The following is an abstract of his address. —EDITOR

MOST MUNICIPAL BUDGETS may be in balance again, whether by good management, good luck, or by some roundabout expedient—but the depression put municipal finance "over the bumps" in no uncertain way. If local self government is to have a safe and sound future there are two major steps in the field of finance which demand the promptest kind of consideration and action. One is the re-establishment of a normal basis of operations. The other is the elimination of at least the most glaring of the shortcomings of fiscal policy and administration revealed by the test of recent difficult years.

By a return to a normal basis of financial operations is meant a return to the sound policy of paying for at least all current expenses from current revenues. This involves the immediate discontinuance of deferring current responsibilities through the refunding of maturing bonds and through the financing of operating deficiencies with long-term bonds—practices now almost chronic with certain cities. These distasteful expedients, in some cases absolutely unavoidable in the worst years of the depression, have now, except in certain very special circumstances, merely become the hokum by which politicians delude the taxpayers about the cost of government.

Such a return to normalcy, unfortunately, must also recognize that the emergency cost item of welfare is becoming a formidable permanent addition to current expense. Borrowing for relief had much justification as an emergency measure, but no municipality which values its solvency dares continue it as a regular means of meeting an obligation which promises to be with us indefinitely. What has been an abnormal expenditure is in the process of becoming a normal one and taxes must be levied to meet it.

Now is the time for removing the more serious shortcomings of municipal financial policy and administration before we forget their recently embarrassing impact. The depression did us a left-handed good turn by bringing these shortcomings to light, and we should take advantage of these disclosures.

Correcting deficiencies

While there is no formula for depression proof municipal finance, the application of a few simple principles, (generally known and advocated for many years by governmental researchers) would so stabilize the finances of most municipalities as to make them much less vulnerble to future economic depressions than they were to the last one.

The varying impact of the depression on the economy of cities does not offer a sufficient explanation of the wide variation in their financial records. Part of this variation can only be attributed to the quality of financial management. In no other way can we account, for example, for the epidemic of financial distress which swept over the municipalities of the wealthy state of New Jersey, while in the neighboring state of Pennsylvania, with its highly vulnerable steel and coal industries, municipal financial difficulties were relatively minor in nature and extent.

The most general administrative cause of difficulties in recent years has been the deadly triangle of defective revenue estimates in the budget, defective administration of the general property tax, and the tendency to maintain a hand-to-mouth financial existence. Recent experience has demonstrated that budgets cannot be balanced in a crisis if revenue estimates are perfunctory or visionary; if some of the so-called revenues depended on are only very slowly realizable; if tax collection administration is lax and not well synchronized with the fiscal year; and if there are no revenue reserves as a safety cushion.

Before the depression, the estimating of budgetary revenues by municipalities was often a perfunctory matter. The common method was to determine expenditure requirements for the year, estimate miscellaneous revenues, and set the tax levy to supply the difference. This worked fairly well in normal times when people paid their taxes at about the same rate of promptness each year.

With the onset of the depression, however, "anticipated revenue" became a more uncertain quantity and the methods used by municipalities in estimating and collecting income began to receive more critical scrutiny from creditors. Whereas formerly short-term credit had often been too easy to secure, and its use had thus been induced when no real need existed, in depression years it became too difficult to secure when there was dire necessity for it.

The present outlook

What is the situation at the present time? A very large majority of the latest municipal operating statements and balance sheets look strong. Many of them are strong, but many more are somewhat misleading because they reflect the support of abnormally large collections of back taxes which cannot continue indefin-

itely. A not insignificant number show the results of fundamental changes in fiscal policy which engender more confidence in future stability. But there is still evident that wide range in current financial status which discloses not only the continuation of traditional bad practices but the adoption of some new ones as well; and there is ample illustration of unsound policies which spell trouble for the next depression, or sooner.

By way of illustration, Boston closed its last fiscal year with the cash in its current account over $26,000,000 short of covering its current liabilities, and with these liabilities only narrowly covered by ultimately realizable assets. Chicago, to cite another outstanding example, depends on property tax levies which are at least 15 per cent uncollectible, yet the courts permit an allowance for loss and cost of less than 5 per cent.

Typifying the cities at the other extreme, Oakland, Calif., an industrial city of over 300,000 population, closed its 1936 fiscal year with $2,700,000 of current fund cash in excess of liabilities—enough to run on for nearly half a year. Again, Los Angeles has not borrowed a nickel for operating purposes, even in anticipation of taxes, for the past thirty years.

Keep accounts liquid

It may be stated as an objective, therefore, that a city's current account should always be kept so satisfactorily liquid that it will temper the effects of any business crisis or special local emergency. What are the mechanics for attainment?

One good answer is cash basis operations—revenue estimates each year based on actually anticipated cash receipts, and any cash deficiency at the close of the year provided for in the budget of the following year.

Budgets constructed on an accrued revenue basis, however, can be made to function with at least equal effectiveness. The theory on which this budget balancing procedure is based is perfectly sound, namely, that taxes actually levied constitute revenue, even though the full cash receipts do not come in within the immediate fiscal year. But the practice is sound only when the revenues actually depended on are ultimately realizable and when they are not so slowly realizable as to be in the nature of frozen assets.

In assuring a continuously sound current position, two automatic procedural steps should be required. First, taxes three years old, or at the most four years old, should be written off or reserved. This not only minimizes dependence on antique and doubtful assets, but it helps to preserve the confidence of creditors and to promote efficient tax administration. Second, a revenue reserve should be built up, either gradually by appropriation or at one time by some special financial transaction such as a bond issue, until it attains that proportion of a year's tax levy which constitutes an adequate margin of safety. Such a reserve will make a city's operations self-financing in normal times, minimize borrowing for operations in business depressions, and maintain a sound basis for securing short-term credit.

Debt control important

Along with some cities' failure to control their current account balance sheets has been their failure to control debt. Even a badly unbalanced budget can be rectified in a reasonably short period of time; but a city which suddenly comes to with a jolt and finds itself with a debt which it cannot possibly, or at least conveniently, repay, is caught in a dilemma from which it may not be able to extricate itself for a generation.

A great many defaults have been cured, and a great many others averted, by the use of refunding bonds to postpone payment. But the actual scaling of municipal debt has been relatively negligible, and excessive debt loads have merely been projected into the future. Many refunding plans have been very ingenious, and some have been highly constructive; but others paid too little attention to the requirements of sound debt structure and largely ignored the fact that a city cannot devote its resources exclusively for the next thirty or forty years to the payment of present debt, but must be able to meet new capital demands.

What constitutes sound policy

A municipality's financial policies and practices must be conditioned by its economic characteristics. It has always been accepted as a matter of course that a city's taxing and spending and borrowing must bear some reasonable relationship to the level of its wealth. But municipal finance has never taken fully into account its appropriate relation to the other wide divergencies in community resources.

We have cities with a well rounded economy of industry, trade and finance; diversified industrial cities; one-industry cities; mining towns; commercial centers and shipping centers for both specialized and diversified economic areas; suburban residential communities; state capitals; resort cities; and even real estate subdivisions incorporated as cities. Additionally, we have cities with populations growing rapidly, stationary, and even declining. They do not all respond alike to a rising business cycle, and certainly they do not follow the same economic pattern through a severe business depression.

What might constitute a safe budgetary or borrowing policy for Hartford, Albany, Cincinnati or San Francisco, with their high degrees of secular and transitory stability, would be less safe for Pittsburgh, Detroit, Akron or Altoona, and still less so for a resort city, a commercial center in the dust bowl, or a factory town dependent on a single steel plant.

Income from taxes in some cities during the depression never fell below 90 or 95 per cent of the year's levy, in others it fell to 60 per cent or even lower. The first class had little need of revenue reserves while the second type was almost helpless without them.

A stable, well-rounded city with a high resistance to economic fluctuations can borrow extensively with impunity. But an automobile city, for example, with wide cyclical swings in income and employment, needs pay-as-you-go financing when it is on the upgrade, and should avoid an even, high level of debt service over a long period of years.

The depression has served to drive home the fact that standards in municipal finance cannot have a rigid, universal application but must be tempered by varying economic realities from city to city. The comparative study of community social and economic characteristics must be more closely integrated with the work of specialists in city finance.

Supervising Texas Waterworks

by Chester Cohen

Principal assistant engineer, State Department of Health, Austin, Tex.

A voluntary system of licensing operators and rating supplies has induced cities to seek and maintain higher grades of water quality

It is the duty of a state department of health to supervise the public water supplies of a state in order that disease may not be transmitted through that medium. Believing that greater protection of public interests can be obtained by education, Texas long since adopted educational practices embodied in a line of attack that includes (1) operator's licensing program, (2) quality rating of municipal water supplies, and (3) posting of highway signs to indicate the quality of the supply.

A voluntary licensing system

In 1933 the Texas Water Works Association formally petitioned the State Department of Health to inaugurate a system of licensing plant operators and rating public supplies. A program drawn up by the association subsequently was ratified by the department. The licensing scheme as it is now administered includes men working in both surface-water treatment plants and well-water systems. All operators on either production or distribution who have direct connection with the actual management of the water supply units, such as water superintendents, water plant operators and plant engineers, are eligible to apply for a license; billing clerks, cashiers or drivers are not eligible.

The underlying purpose of this licensing is to acquaint the citizens of each community and their governing officials with the importance of maintaining trained and capable men in positions of trust and confidence where the matter of supplying drinking water to the public is concerned. In place of the previous conception that anyone who can run a pump can handle a water system, the license builds up the idea that a man must have special training, experience and knowledge to handle the job of producing drinking water for the public. Also, the license tends to reduce the uneconomical turnover in the waterworks personnel due to political causes. An incoming or unfriendly administration will necessarily hesitate before replacing a trained and licensed operator with some political favorite who does not hold this operating certificate of ability.

Fig. 1. "Approved" sign means that the city's supply rates better than 92.

All men who are in actual charge of water supplies are eligible to apply for a license provided they have had at least one year's experience in the position of producing or distributing drinking water. In other words, a theoretical or inexperienced operator is not eligible to hold this certificate.

License requirements

The licenses are divided into three groups, A, B and C, of which A is the highest, and no operator is eligible to apply for a higher grade license until he has first passed the lowest, or Grade C. To qualify for a Grade C license the operator must have a general understanding of the following terms: "water supply protection", "satisfactory bacteriological results", "potential health hazards" and "water plant operation."

After passing the Grade C examination the operators are then eligible to take the higher grade. The questions for these higher grades are not announced until the time of the examination. These advanced examinations require further study and training. Likewise the experience qualifications, as well as the knowledge qualifications, are raised to a higher level for the advanced grades.

From the standpoint of the Department of Health the chief factor in this entire procedure is training and educating the water plant operators to produce water of better quality. In order to do this the program is entirely educational and voluntary, and this voluntary nature of the entire licensing procedure is always stressed. It has been our policy to discourage any attempt at coercion; neither have we encouraged legislative enactment of a licensing law, for the reason that so much success has been attained with the voluntary scheme.

The wholehearted cooperation of city officials has been obtained by recognizing their relationship to the public water supply. As soon as the state advisory licensing committee passes favorably on the application of a waterworks employee for a license, the Department sends the examination papers directly to the governing official of the city, who conducts the examination, certifying the operator's answers to the questions, and returns the examination sets to the department. All of the examinations are graded by a teacher in a state institution. If a passing grade is made, the license is issued

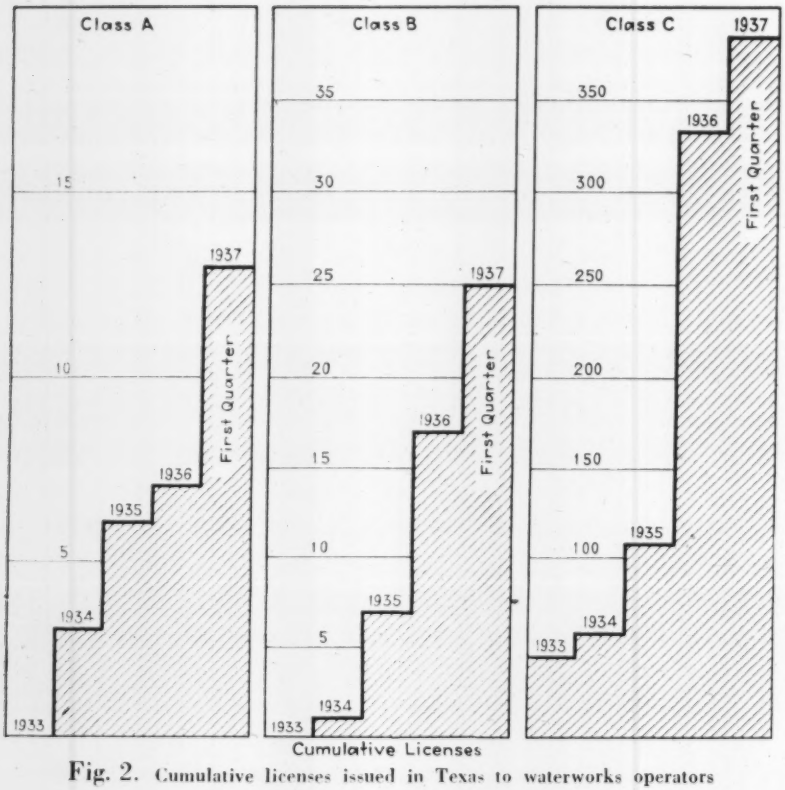


Fig. 2. Cumulative licenses issued in Texas to waterworks operators

under the signature of the state health officer, the state sanitary engineer and the Texas Water Works Association through its president and licensing committee chairman. The license is then sent to the mayor, or other governing official, with instructions to hang it at the water plant or waterworks office, where it can be seen by the public.

The educational program does not stop here. A check is introduced at this point to insure continued study and development. The Grade C license certificate expires three years from the date of issue, which means that the operator must continue to study and prepare himself to take the next examination in order to hold his grade at the end of the expiration period. Practically all of the men who received their Grade C licenses immediately signified their intention of studying for the higher grades. There are no charges or fees in connection with the license program at any point.

To date something over 400 licenses have been issued, and the entire waterworks profession in Texas is unanimously behind this effort to improve public water supplies and working conditions.

The Health Department personnel has observed with some degree of envy the success that has attended the efforts of the State Fire Insurance Commissioners in securing their recommended improvements and their ability to translate the rating of the defects of a water supply into the unit values of dollars and cents, which has resulted in mutually cooperative remedial action by the cities involved. Some way was sought to translate the engineer's field findings on water supply sanitation similarly into terms of unit values.

We desired to present to the commissioners and other governing officials and citizens in concrete form a definition of their water supply's potentiality. We wanted to give a value to the supply which was readily explainable to the layman in terms of safety, and then we wished to give recognition to those cities making the improvements that had been suggested. We wanted to encourage the maintenance of trained operators on the job in order to insure the intelligent handling of the water supply system. And, in addition, we wanted to safeguard the operator in his job and to bring to the water profession a degree of dignity and stability that had been lacking.

A way to realize these desires was found through establishment of a sanitary rating procedure which tied in with the posting of public highway placards and licensing of water supply operators. The outline for this rating scheme was largely drawn from a paper by E. Sherman Chase before the New England Water Works Association. Using that as a starting point the present plan was developed step by sep.

Developing the rating system

First, an empirical table of values was set up, within the limits of which it was intended to have the rating scheme function. This table included the three methods of expressing evaluations—letters, words and figures: A+, perfect, 95 to 100; A, excellent, 90 to 95; A— good, 85 to 90; B+, safe, 80 to 85; B, fair, 70 to 80; B—, questionable, 50 to 70; and C, unsafe, 50 or below.

The next step was to choose certain cities which we felt merited such classifications as questionable, fair or excellent. The rating figures and formulas were then adjusted so that these towns fell within the desired classification. This process was repeated again and again, for about three years, until the final formula could be depended upon always to express in numerical figures what the inspecting engineer would feel to be a fair classification.

The greatest satisfaction has been derived from the unexpectedly beneficial results of the program. Probably as many corrections are now being secured per month as were formerly secured in twelve months' time. This is not difficult to understand when one visualizes the operating engineer or the waterworks superintendent discussing the field findings with his council and asking for funds to make the necessary improvements. Using the rating figures or rate symbols he can state that a covering on the reservoir, a fence around the pumping plant or a cast-iron sewer line within 50 ft. of the well, would add a certain definite number of points to the total rating. This is a tangible record which is readily understood by the non-technical listener.

Then, too, the average citizen can compare his city's rating with that of an adjacent town, and pride will cause him to wish at least to equal

the rating figures of the neighbor city. Sometimes it is difficult to explain why an uncovered reservoir is insanitary and questionable, and to make this reason strong enough to persuade the city council to spend fifteen or twenty thousand dollars out of the general fund for the improvement. But a gain in rating of eight points for this correction is easy to visualize, and these extra eight points might be sufficient to permit that town to erect highway markers indicating the state's approval of the supply.

Ratings posted on highways

Any city water supply that has a rating of more than 92 points is entitled to sign an agreement with the Department of Health authorizing it to erect on all highway entrances a marker which advertises the fact that the department has approved that city's water supply. Any time that the city's rating falls below the required figure the contract provides for the removal of the sign. It is felt that once the signs are erected and have taken their definite place in the public mind, no city administration will wish to give cause for their removal.

The bearing of these public notification markers upon the licensing of operators can be readily seen. A licensed operator in charge of the plant contributes 8 credits to the score. If the operator were fired or removed from office and if the city had a total rating of even 100 points, then the final rating after the operator's removal would be only 92, or below the requirement for maintenance of the signs. The Department of Health would then feel that in the absence of a trained and capable man it would be unable to guarantee the safety of the supply; therefore, it would regretfully order the signs removed from the highways. It is felt that administrative officials will be extremely reluctant to remove their waterworks operator, when they realize that such action would forfeit the Department's approval of their water supply. Usually the citizens would be too jealous of the safety of the supply to permit such a questionable situation to arise.

The average grade on the first inspection of almost every city is 35. The second inspection usually discloses that about 50 per cent of the recommended corrections have been complied with, and the average rating attained at this time is usually in the neighborhood of 75. The third inspection is usually all that is necessary to ascertain that all the corrections have been completed and that the town is ready for its official approval.

A few statistics at this point should be enlightening. At the present time 499 cities have been rated, and of these 97 have been rerated. During the first eight months that the rating program has been in effect the six district engineers completed 83 water ratings each, in addition to their other field duties. There are 772 public water supplies—615 well supplies and 157 surface supplies. Twenty-nine towns have been given authority to erect public highway approval markers. Out of the 499 cities inspected and rated, there has been only one complaint.

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Cross-Connection Elimination Stimulated in Los Angeles

LAST YEAR'S PROGRAM for the elimination of cross-connections to water pipes in Los Angeles was a vigorous one, 575 being taken out or protected by vacuum breakers. R. F. Goudey, sanitary engineer of the Bureau of Water Works and Supply gives the following account of operations in his annual report:

In some cases the city water distribution system was protected from entire plants by the installation of double check-valve systems specially designed for this purpose. There have been eight systems of double check valves installed in the past year, ranging in sizes from 4 in. to 12 in. and in cost to the consumer from $400 to $3,200. The double check-valve systems are inspected every six months. All of the systems which have been installed to date have been inspected once this year and some of them have been inspected the second time.

The use of vacuum breakers for the protection of certain types of cross-connections such as wash-down hoses in fish canneries, packing plants etc., presupposes the passage of the flush-valve and cross-connection ordinance which is now proposed by the department of building and safety. This ordinance has been in preparation for more than two years and has as yet to be reported out of a committee of the City Council; some objections have been raised, chiefly by the city health department, certain manufacturers, and owners of old buildings.

A number of tests of flush valves and vacuum breakers were made at a temporary field laboratory, consisting of a 12-in. street main 4,700 ft. long with 270-ft. difference in elevation between the high and low points. Pressure was reduced from 50 lb. per sq. in., static head, to 28½ in. of mercury vacuum. For test gauges, flush valves and vacuum breakers were attached to a fire plug in this main and to a system of piping laid out for the purpose.

A procedure to prevent the installation of cross-connections, especially of the direct type, was inaugurated during the past year. This method consisted of approaching the owners and builders of new buildings using new services and warning them of the dangers of cross-connections. If this overture failed, they were warned of an existing ordinance by which they would be compelled to remove any cross-connections installed. It is safe to say that at least 10 per cent of the intended cross-connection installations have been prevented in this way.

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Leakage Tests

A TEST for leakage in the cement joints of a 30-in. water main in Western Ave., Los Angeles, as noted by Thomas Brook, engineer in charge of the Distribution, Construction and Operation Division, in his annual report, indicated an average of 3.28 gal. per inch diameter per mile of line per day. This compares with 100 to 200 gal. allowed for water lines installed by contract.

Town Planning Requires Engineers

by HENRY A. SHAUFFLER
Alexandria, Va.

From preliminary surveys to finished construction, every phase of the new science of town planning involves problems of an engineering nature

Until recently the author was associated as an engineer with the Resettlement Administration in the planning and building of low-rent community projects. His experiences have revealed the need for engineers in this type of work, which concerns itself in many respects with economic engineering design. In the following article he outlines some of the opportunities in this new field of endeavor —EDITOR

TOWN PLANNING is rapidly emerging from the realm of much talk and vague theory into the sphere of practical reality. And with this change the civil engineer should take cognizance of the opportunity to assume active leadership in promoting the development of soundly planned projects.

Unfortunately there are too few engineers now in this work. Often they are ruled out of consideration on the supposition that they are too practical and lacking in foresight to envisage completed towns in terms of scenes and vistas. Yet, in every phase of town planning—from preliminary surveys to finished construction—the engineer by virtue of his basic training can find himself well adapted. This becomes apparent when we review the various aspects of planning and note the pitfalls which can be avoided by applying engineering methods and practice.

Initial survey important

Since all development planning is based first on the topography of the site selected, land surveys must be made. This is the first place for trouble to enter and cause difficulties which may seriously affect the cost of the entire job.

While it is true that rough preliminary surveys are sufficient for the initial studies, these are not suitable for use after a general site has been chosen. The basic survey of the site should be made with such accuracy that it may be used as the base for all future work. Still we find that the first traverses of selected sites are frequently run as a farm survey with the emphasis laid, almost wholly, on speed. Studies are then started and additional topography called for as the layout takes form. The transition from this beginning to the formal plans is so easy and natural, that the inherent inaccuracies of the base are either forgotten or neglected. The field forces are then faced with the impossible task of laying out a town, within an error ratio of 1 in 15,000 from an original survey made to an accuracy of less than 1 in 3,000. The investment of time and money on an accurate base traverse is negligible when compared with that spent on resurveys, computations, check measurements and revisions.

Again, too much stress cannot be given to the need for crossties and checks on all random lines, both for alignment and elevation. Likewise, such definite topographic features, as ridges and natural drainage lines, should be located with more than average care.

One of the first considerations in a town plan is the general layout of access roads and the streets of the development proper, based partly upon the size of lots and partly on the desired population per acre. While we are no longer restricted to the use of the old-fashioned rectangular block system, some semblance of order should still be considered a virtue, if for no other reason than to make it possible for the inhabitants to find their way home after dark. Too often the attempt to break away from tradition has led to a maze of irregular curves, staggered intersections and peculiar lot lines. As a result it is exceedingly difficult to calculate and describe street and boundary lines.

It should be borne in mind while making street layouts, that sewers must be laid on tangents, that bends and specials add to the cost of water mains, that overhead wiring on curves will require guyed poles and also, that in all but lease or rental developments, it is the best policy to keep all such utilities within the street right-of-way. Visibility, in both alignment and grade, is just as important in through town streets as it is on the main highways, and no argument for the beauty of curves should be allowed to diminish it. The "super block," as developed on the Greenbelt, Md., project of the Resettlement Administration, has proved to be a very satisfactory solution along the more modern lines of street layouts.

The actual design of the streets is undoubtedly still within the province of the engineer. But, here again, one meets with the ex-realtor's desire to cut costs or with some visionary's penchant toward pink pavements for picturesque purposes. There is true economy in constructing well-graded and properly drained subgrade, with a permanent type of pavement.

Sewerage facilities

As the street layout design progresses, the design of the sanitary sewer system should be carried on simultaneously. Coordination here will save a great deal of time and expense later on. The term sewer system is used here in its correct sense and is not intended to include what has been so aptly dubbed, the "skeptic tank." The use of these tanks, in anything but a strictly rural develop-

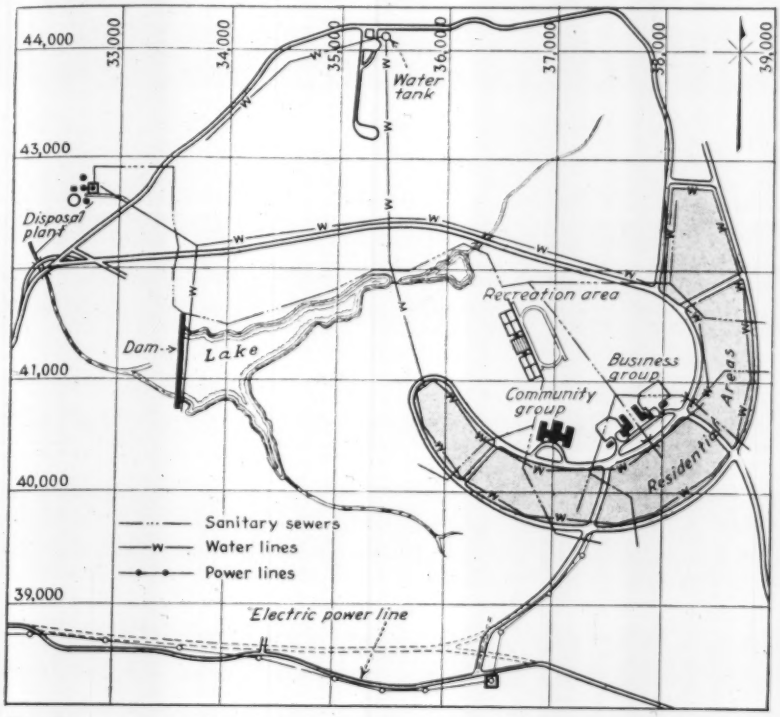

Fig. 1. Town planning, as exemplified in such undertakings as the Greenbelt, Md. project of the Resettlement Administration, involves many problems of an engineering nature.

ment with widely separated houses, is false economy.

Wherever possible, it is advantageous to make connections with an existing system, but for the larger, new developments this is sometimes not possible, either because of the distance to a trunkline, or the inadequacy of existing treatment works. It is necessary, therefore, to select a site for a new sewage treatment plant that will serve both the present and future requirements of the town. The site chosen and the grades of the sewers will have a very definite effect on the road locations and grades, as well as on house locations.

The matter of sewer and sewage treatment plant design is so evidently the province of the engineer that it hardly seems needful to mention it. Yet it adds one more major argument in favor of engineering control of town planning projects.

Storm drainage is another problem that is closely interlocked with the street layout and design. It also has a vital effect on the location of houses, walks and the grading of the entire project and should, therefore, be studied simultaneously with all three subjects.

While it is unnecessary to carry off all stormwater in the same general line as the sanitary sewer, care must be taken in the location of the various outfalls to guard against undue discharge onto adjacent lands or the creation of undesirable conditions in the property designated for future extension of the project itself. The scope of this phase of the planning is very broad and requires careful study. For, aside from the computation of the runoff, there is the matter of design and location of inlets, the special problems created by bridges and underpasses, collection lines from roof leaders and cellar drains, foundation drains, trunk sewer layout, and outfall and culvert design.

Water distribution details

The next of the underground utilities to be considered is the water distribution system. The planner should avoid the false economy of individual water supplies with their wells, pumps and pressure tanks, and the ever present danger of pollution and the uncertainty of dry-weather flow. Excellent though they may be for farms and isolated houses, they have no place in town or community planning.

Examination of insurance rates will aid in determining the amount that can be spent on the construction of a water system. Even in the most extreme cases the capitalized savings over a reasonable period, will more than cover the difference between just giving water and the furnishing of a real supply. In the selection of the sizes of pipes for mains, secondary grids and house services, and in the location of fire hydrants, the conscientious designer should strive to give adequate service to both the individual property holder and the community.

Other public utilities

The next items for consideration are usually thought of as the "public utilities," and therefore side-tracked as matters for argument with the various company officials. This is coupled with some wishful thinking that their layouts may be somewhat consistent with the scheme of things, without any extra charge therefor. Yet, in most of the contacts that the writer had had with officials of gas, electric and telephone companies, there has been a definite desire on their part to cooperate to the fullest extent permitted by regulations.

When dealing with utility companies it is desirable to furnish project layout plans and designs. For the gas company, a comprehensive plan showing the water and sewer lines and a designed right of way, leaves them with the comparatively simple task of designing mains, based on the demand requirements of the project. On many of the federal government projects electricity is being purchased in bulk, through a master meter, and the entire distribution system is designed and constructed by the planning staff. The latter assumes full responsibility for these lines and the power company generally reciprocates by offering lower rates. While this plan is applicable only to cooperative housing schemes, the general procedure can be used in any town planning project. Based on power demand and service requirements tentative layouts can be made. These should show rights of way, pole and transformer locations and other pertinent data. Coincident with the power layout, the telephone company's interests should be considered, whether they use the power poles or their own. Here, indeed, cooperation

pays dividends reflected by the elimination of extra charges to the project.

House location problems

The next point at issue—house location—is probably one of the most controversial questions in town planning. The engineer might well serve as a referee in this matter. With the architects thinking in terms of room relationship, exposures and light and the planners stressing vistas and the prevailing wind, the number of possible solutions is almost infinite. The referee's job is to integrate these viewpoints with practical considerations, and bring about definite decisions.

With the house location decisions reached, it should be the engineer's prerogative to compute the exact locations by coordinate, or some other equally precise method, in order that the staking plans may show the houses and their accessories in the proper relationship to the utilities. Too much should not be left to the judgment of the field party. The measurements given on many plans have been from street intersections, curved center lines and other such points. These offset locations have created many inaccuracies in field staking, which have resulted in property line tangles, building encroachments and other complications.

Another controversial point is the matter of grading and, let it be stated clearly, it is not the intent of this article to minimize the excellent work of the town planners in seeking to enhance the beauties of terraces and slopes between and around the houses and along the roads. But, there are so many incidental problems, such as surface and sub-surface drainage, inlets and culverts, erosion and pipe coverings, that this matter assumes more of an engineering aspect than it is ever credited with. Sodding and planting may ameliorate some of the troubles, but they don't supplant sound engineering practice.

Walk and driveway locations should be made simultaneously with the grading plans, as the tie-up between them is vital. Any lack of coordination here will cause difficulties which may revert to the storm sewer layout itself, for these features act as rapid run-off areas and waterways.

Complementing the planning of any developments are the various community facilities, whose number and scope depend on the size and type of the project. Zones must be established for stores and gas stations and provisions made for schools, churches, and fire houses, while the larger towns will require a wastes disposal plant, preferably a modern type of incinerator. Of equal importance are recreational facilities, ranging from simple play areas to fully equipped athletic fields, swimming pools, or artificial lakes.

Paralleling all the considerations that have been brought out thus far are those "necessary evils," the specifications. Writing specifications is considered by many to be a separate vocation and is left to the devices of these specialists. Experience has shown, however, that the mere knowledge of phrasing clauses and developing systems for paragraph numbers is far from the training required to produce satisfactory results. Neither is a man trained in architectural matters, competent to express what is desired on the engineering phases of the work. A careful review of many specifications from numerous town planning projects, will prove quite conclusively that, here again, the exacting training of the engineer qualifies him for this important work.

Town planning is an activity of broad scope. To be a specialist in it requires more than a knowledge of contours and curves, coupled with a fertile imagination and an eye for beauty. Important as these creative attributes may be, there can be no refutation of the fact that each step in the development of a comprehensive plan invites the cooperation of the civil engineer. In design, construction, and general planning his knowledge and guidance will assure the successful completion of projects.

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Groundwater Supplies Menaced In New Jersey

GROUNDWATER SUPPLIES for the large industrial developments in a triangular area of about 30 sq. mi. between Perth Amboy, Spotswood and Sayreville, N. J., can be developed to yield only a little more water than is now used and are in grave danger of contamination by salt-water, according to a report recently issued by the New Jersey State Water Policy Commission.

The industries in this region obtain most of their water from wells drawing from a sand bed known as the "No. 1 sand" which is from 120 to 170 ft. below the surface of the ground at Parlin and slopes downward toward the southeast. The cities of Perth Amboy and South Amboy, however, obtain most of their water from a higher bed and draw only a little water from the No. 1 sand.

The report states that when wells were first driven into the No. 1 sand in 1897 the water rose 35 to 40 ft. above sea level, while in 1935 the water level in some of the wells was as much as 73 ft. below sea level. In 1929 the total pumpage from the No. 1 sand in this district was about 8 million gallons daily and in 1935 it has increased to 10 million gallons daily. The Water Policy Commission's engineers estimate that in 1935 the draft on the wells lowered the level of the groundwater as far as 10 miles from the wells. It was concluded from this that in very dry years no more than 10 million gallons of water daily can be pumped from the No. 1 sand without reducing the supply available in the future, and that in years of normal rainfall only a small additional amount can be pumped safely.

Studies indicated that the ancient channel of the Raritan River was cut down into the No. 1 sand and has been filled with very porous later deposits, leaving only the silt and mud in the present river bottom to protect the No. 1 sand from contamination by the brackish water in the lower Raritan River. Dredging operations in the river are stated to be a distinct menace to the fresh water supply of the industrial plants.

The work was under the general direction of O. E. Meinzer of the U. S. Geological Survey and H. T. Critchlow of the New Jersey State Water Policy Commission. Copies of the report may be had upon request to the commission, Trenton, N. J.

Drafting Land Descriptions

by ARTHUR W. BEDELL
Faribault, Minn.

Specific technique and wordings are outlined for preparing brief but accurate descriptions

DEFINING a tract of land or its boundaries so that the tract may be found and marked out, not on a plat, but on the ground that it is to be conveyed, is the job of a land description. To accomplish this, it is essential that a land description be brief, understandable, uniform and accurate. Methods in common usage, such as using inconsistent terminology and long, legal phraseology, following a dimension written in words with the same dimension written in figures, placing the smallest unit first in naming a tract by section and subdivision thereof, combining different units of measurement, and indiscriminately using due north and other directional terms, are all subject to criticism as contributing to the defeat of the description's purpose—conveying lands. Correction of these difficulties by revising certain common practices, attaching a plat to the description, and defining terms now subject to indiscriminate use will aid in preparing a land description that will convey land in a simple, easy manner.

First of all, a land description should be grammatically correct. This does not necessarily mean that it must be rhetorical, for repetition will frequently occur and it is far better to always refer to the same corner in exactly the same words than to vary this each time for the sake of smooth reading. Descriptions are sometimes written as if they were orders to the surveyor, directing him to "begin," "run," but it should be remembered that it is land being described and not a surveyor being instructed. Participial forms such as "beginning," "running," are preferable. Punctuation mistakes, most frequently encountered, are the most misleading. Commas and semi-colons carelessly used may annul the meaning of various phrases so a good rule is that of arranging all words in such order that accidental insertion or omission of a comma will not alter their meaning.

Short-cut methods

Brevity is essential to prevent the confusion resulting from the carrying of long terms in one's mind. Various expressions in common use could be shortened considerably. For example, the legal expression "according to the plat thereof now on file and of record in the office of the Register of Deeds in and for Brown County" can easily be reduced to "according to the recorded plat thereof," for in each county there is only one recorded plat with a certain title, and only one register of deeds. Similarly, the following of a dimension written in words with the same dimension written in figures, a practice partly borrowed from check writing to prevent alteration, is generally unnecessary. To say "north thirty-two degrees and fourteen minutes east, thirteen hundred and twenty-two and eight-tenths feet (N 32° 14′ E, 1322.8 ft.)" is conducive to error through its volume alone and quite unnecessary for the bearing and distance of a course in a closed traverse cannot be falsified without impairing the closure. More mistakes have been made in copying bulky descriptions than have been prevented by their use, and what can be said of such a precaution when the words and figures disagree? There is justification for the repetition, however, when the use of figures alone might invite an alteration which would raise their value. Another example of the need for brevity is that of using the detailed description "the northeast corner of the northeast quarter of the northeast quarter of Section 1" to obscure a corner that is nothing else but the northeast corner of Section 1. There is only one northeast corner, one north quarter corner, and one center, in each section and they should be so named.

Expression and arrangement

Clarity of expression is essential to prevent ambiguities that cause much time to be lost in attempting to construe terms. Attaching a plat with its few lines and figures to the description and making it a part of the instrument will often do more to clarify a description than will a whole page of words. There are many illustrations of this.

When a boundary description involves many courses by bearing and distance, tabulating the course in figures only is a simplifying procedure:

Beginning at the center of Sec. 12
Thence N60°12′E, 850.5 ft.,
Thence N55°40′E, 10.0 ft., to center of stream
Thence N32°15′ W along stream, 85.0 ft., to the point of beginning

If words running together in a solid paragraph are used instead of the above tabulation to describe the courses, future mistakes in copying will result.

Uniformity greatly simplifies interpretations. A uniform arrangement and a logical sequence of the parts of a description should be followed on every occasion. For example, when a course is described it is logical to think first of the direction, for the bearing must be plotted before the distance. The sequence should then be: Direction, distance, corner, as: N 40° E, 100 feet to section corner. If an adjoiner is mentioned, its place is between the bearing and the distance; and if ties, or a detailed description of the corner are given, let them follow the mention of the corner, as N 40°E, along railway right of way, 1000 feet to section corner consisting of a 6x6 limestone. By always following such an order, the chance of omission is rendered less probable.

Using consistent terms

Consistent terminology requires the use of a specific word every time for the same specific meaning. Terms such as "north," "due north" and "northerly" are often used indiscriminately, without regard to whether the direction intended is precise or ap-

proximate. Consistent use of these words would restrict them to the following meaning: Due north to mean on a meridian; northerly to mean any vague direction with a north component; north to be construed according to its use, presumably due north, but also northerly along a section line which may diverge considerably from the meridian. A line departing from the north by an obvious angle is better described as "northeasterly." If a traverse is to end at the point of beginning, then it should not *commence*, but *begin* there. Frequently the description of a closed traverse is preceded by a tie, which results in two starting points. Confusion of these two points may be avoided by employing a different term for each, always reserving "beginning" for the tract itself.

Two greatly-misused terms are "at right angles to" and "parallel with," and their use should be avoided unless these exact directions are intended. Describing any interior line of a section as parallel with or at right angles to an exterior line is incorrect, and may cause a surveyor to run a line deviating from the usual subdivision line, because quarter section lines almost never form parallels or right angles with exterior sides except in closing tiers of sections, and the same applies to subdivisions of quarter sections. All ambiguity can be eliminated regardless of the true bearing, by the use of such expressions as "south along the quarter line," or "east along the south line of said forty."

Revising common practices

Many common practices in writing land descriptions might well be revised. A general practice is that of placing the smallest unit first when naming a tract by section and subdivision as: The S 100 ft. of the N 500 ft. of the NW¼ of the SE¼ of Sec. 16, T 116 N, 20 W. Much time is lost in "backing up" on such a description in locating the tract, for it can not be traced out in the order given. Since the larger unit must be found first, why not write it so? In defiance of custom it would then read: In T 116 N, R 20 W, Sec 16, in the NW¼ SE¼ thereof, the S 100 ft. of the N 500 ft. thereof.

When bearings are not used, angles are often described in a manner that leaves the surveyor in the dark as to whether an angle from foresight or from backsight is intended. An example of this is the expression, "At an angle to the left of 89° 15′ from the south line of the section" which has two meanings. Two expressions that make this direction clear are: "thence deflecting to the left from the easterly direction of said line," or having followed the section line, "thence deflecting to the left."

There is no excuse for combining different units of measurements such as "the south 6 rods and 25 ft." Where such hybrids occur, it is evident that somebody in the past has shirked a duty, and pieced together part of adjoining descriptions, whereupon there is a presumption of irreconcilability. There is no better way to invite trouble than to make up a composite of several descriptions, each one having been formed under different conditions with different degrees of reliability and error. Even if accurate, mixed units make the work unusually difficult to trace.

Correcting mistakes

Obvious blunders should be corrected. A blunder such as "S120° W" is sometimes seen; and although such a bearing is not fatal if the description closes, it is disconcerting. The use of a magnetic variation as copied from a Land Office plat and given instead of a bearing, or the naming of a degree of curve in place of a deflection angle, both show the folly of introducing copied terms of which the writer may have little understanding. The words "to the meander line" instead of "to the lakeshore" may be the source of much trouble unless the grantor intended to except that portion between the lake and the meander line, since the meander line is not in itself a boundary. When an obvious mistake has been found, it should be corrected and any necessary certificate or correction quitclaim recorded; an obvious mistake should never be perpetuated.

Greatest priority

In metes and bounds descriptions, boundaries may be defined by monuments, by adjoiners, or by courses, with these three elements prevailing in authority in the order named. The conveyance should not omit that element of greater priority when it can be used, if the description is to have maximum validity.

In all descriptions it is land and not a plat that is to be conveyed, and it is the surveyor who must locate and stake out the land from the given description. Therefore, the test of any description is this: Can the tract to be conveyed be located with certainty by a competent surveyor? If the description fails in this test, the conveyance is useless, no matter how learned its language, how legal its execution, or how eligible for record.

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Water a Complex Chemical Mixture and Reagent

EMPHASIZING the fact that water is a complex mixture as well as an active chemical reagent, A. M. Buswell, Illinois State Water Survey, in a paper before the American Chemical Society on Sept. 7, states that it is capable of a surprisingly large number and variety of reactions. He pointed out that liquid H_2O contains four different molecular species in addition to aggregates. "Pure water" contains, in addition, the compounds of the isotopes. If these are counted, the number of different kinds of molecules in the liquid known as chemically pure water is certainly not less than twenty. Attention was called to the importance of the "hydrogen bond", a relatively recently discovered chemical property, in connection with water technology.

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Hydrogen-ion Measurements to be Standardized

THE APPLICATION of hydrogen-ion (pH) test and control in scientific and industrial problems is now so widespread that the National Bureau of Standards is establishing primary pH standards to within plus or minus 0.001 pH, determining the errors inherent in practical pH work, and studying the performance and characteristics of colorimetric, electrometric and conductimetric pH apparatus for use in calibration. These and other facts relating to formulas and definitions for thermodynamic, semi-thermodynamic, and practical pH values were given in a paper before the American Chemical Society on Sept. 7.

Valves Automatically Control Flow

A new-old type of valve with automatic controls is being used in increasing numbers to curtail breaks

PROTECTION of water distribution systems against emergency conditions created by major breaks, undue pressure rises, and water hammer is the objective of the newer thinking in waterworks operation. When New York City has two major breaks per month and other cities have a proportional number of breaks the seriousness of these accidents becomes apparent. During the last 10 years the control of these attributes of water under pressure has been greatly aided by the rapid development of the conical plug valve. Conical plug valves are not new, however, as patent applications were filed in their behalf as far back as 1853.

E. C. Brisbane, chief engineer of the valve division of the S. Morgan Smith Co., stated the hydraulic problem facing distribution operators, in a paper presented on June 18 to the Colorado Section of the American Society of Civil Engineers. The following notes on the various problems and the installations used in solving them are abstracted from Mr. Brisbane's paper.

Development of the valve

Much progress was made from 1929 to 1932 not only in the mechanical development of the valve but also in the solution of the hydraulic problems it presented. Since that time more than $400,000 has been spent in developing and testing the conical plug valve and today several hundred patents are on file covering various phases of the conical valve art. These facts indicate the importance hydraulic engineers attach to the adequate control of water hammer and surge.

The valve lies in the same category as any rotary type of valve. While it has a conical type of plug which is first lifted axially in a straight line movement out of its seat, and is then rotated to full open or full closed position, it nevertheless operates with a rotary movement to open or close the line. The valve design is not particularly new, but the adaptation of automatic control to the rotary type of valve is of comparatively recent origin.

Methods of automatic control

The automatic control for any type of rotary valve used in a check valve installation may be of the straight hydraulic diaphragm type actuated by pitot tubes or by a combination of pitot tubes and piezometers. The valve may also be operated through a straight hydraulic control actuated by means of a pilot valve mechanically connected to a solenoid in the motor circuit if the pumping unit is motor driven. If the pumping unit is driven by a diesel unit or by steam, it is generally found more practical to use the straight hydraulic diaphragm control.

Controlling water hammer

The sudden stopping of the flow of water creates water hammer, a phenomena resulting from an impact blow, and not to be confused with surging. Generally, the object of a control on a line subject to water hammer is to close the line, by means of a valve, at the exact moment the column of water comes to rest. Many factors enter into the design and operation of such a control system complicating the problem and making field timing tests of an installation a necessary adjunct in many cases. With such tests, it has usually been possible to set an automatic rotary type valve to operate within the danger period of the system or pipe line. In five hundred installations the cases of the pressure rise under automatic control ever exceeding 20 per cent of the normal pumping head have been rare.

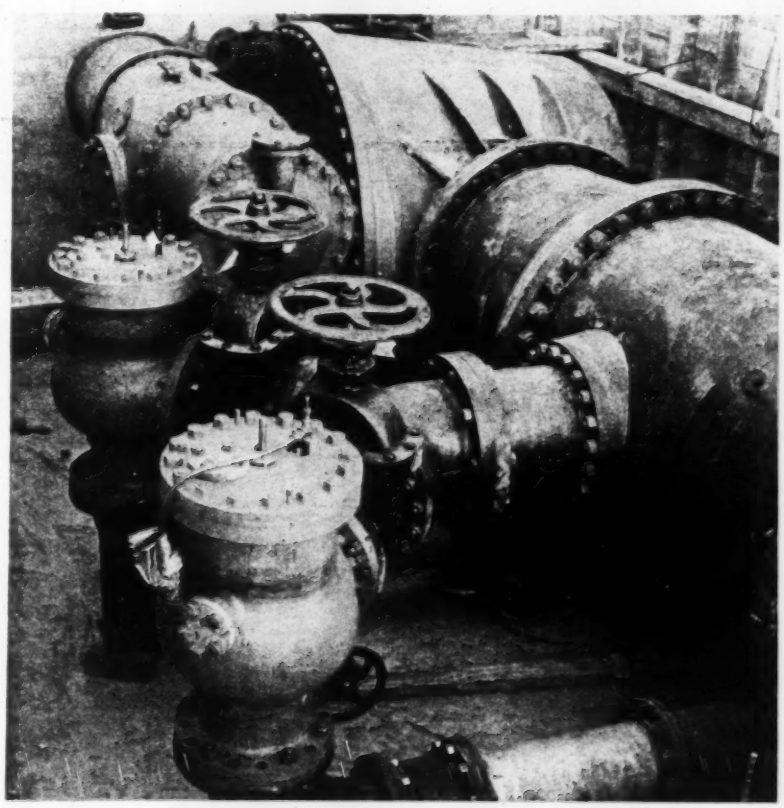

Fig. 1. A 36-in. automatic cone regulating valve (top center) and two 8-in. surge relief valves (left) aid in protecting Denver's new West Side filter plant.

The hydraulic phenomenon of pressure reduction such as that occurring at a valve connecting high pressure and low pressure service lines requires a different type of automatic control. An installation will operate quite satisfactorily with a straight hydraulic control of the balanced-diaphragm type if the pressure reduction ratio is less than 3:1. For example, the reduced pressures may easily be held within a range of 2 lb. per sq. in. when the desired reduction is from 125 lb. to 40 lb.

Vibrations in the valve may occur, however, with pressure reductions of greater than 3:1. These vibrations are generally caused by vacuum pockets forming on the discharge side of the valve at certain throttle positions, but fortunately several methods of eliminating these vibrations to a certain degree are available.

The vacuum pockets may be vented by the introduction of air at these pockets, or where it is not practical to admit air into the pipe line, high pressure water may be fed into the negative pressure region. The effects of the cavitation that such vacuum pockets tend to create are reduced by these procedures.

Pressure reducing valves

Many factors concerning the installation of an automatic control of pressure reduction must be studied carefully before a definite recommendation can be made. Reductions in pressures from as much as 350 lb. on the inlet side to 40 lb. on the discharge side of reducing valves are being handled but insufficient experience with these wide ranges of reduction prevent any definite statements as to the ultimate results. It is expected, however, that enough information will be obtained from tests now being conducted on such installations to enable publication of useful data within the next two or three years.

Long gravity pipe lines are now being controlled by a series of pressure reducing valves at various points, each valve having the definite function of dissipating a certain amount of energy. These valves lower the pressure gradually, instead of taking wide range of pressure drop through one valve at the end of the line, and offer a satisfactory method for controlling surges and reducing water hammer in long lines.

Another type of installation requiring the use of a regulating valve is that of a line discharging into a reservoir or into an open basin. The valve, placed at the end of the line, must be of the automatic type. In this case it is found more practical to use a control operated directly from a float instead of a standard reducing control. It is possible to maintain a level in the reservoir within 1½ in. of the desired elevation. This type of reservoir control may also be accomplished electrically by means of a motor-operated valve.

Automatic valve control

Automatically controlled systems are not completely foolproof due to such variables as the possibility of imperfection of materials and normal wear, but sufficient knowledge of design has been attained to make such systems reasonably safe. In many installations, however, a secondary precaution has been incorporated by using automatic emergency relief valves tied in with the automatic controls.

Some relief valves, referred to as energy absorbers, will open when the pressure drops. Others, referred to as surge relief valves, open when the pressure rises. The surge relief valves are generally set to operate at pressure slightly higher than the maximum operating pressures, their chief function being to open at an extremely rapid rate when the pressure suddenly rises above normal operating pressure and to remain open as long as that condition exists. In the case of the control of a gravity line the author feels that a valve operating on a pressure rise is the more satisfactory, this opinion being based on the fact that it is difficult to establish a low point at which an energy absorber would open due to the various draw-down conditions of the line under varying operating requirements.

The energy absorber operates satisfactorily when used with an automatic check valve. For example, the stopping of a pumping unit pulls the water away from the check valve and causes a pressure drop. This operates the relief valve which opens the check valve before the water returns and then slowly closes it. The shock to the system is reduced by bleeding the line to the atmosphere through the valve. In most cases it is possible to time the automatic check valve so perfectly that a surge suppressor type of relief is not needed.

Numerous controls available

Advances recently made in the design of automatic controls now enable several manufacturers to build control equipment for almost any type of hydraulic operation. At present there are 1,500 installations of conical or rotary type valves in the United States representing an investment of more than $3,000,000, and it is believed that many large cities will be operating their entire waterworks systems under automatic control within a few years. Denver, Colo. (*ENR*, June 3, 1937, p. 813) and Sioux City, Ia., are two municipalities which have already applied this modern method of practically complete automatic control to their water systems.

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Electrolysis Surveys Mapped in Los Angeles

THE ELECTROLYSIS SECTION of the Los Angeles water department's construction and operation division has accumulated by surveys enough data to prepare corrosion and electrolysis maps of the metropolitan, the harbor and the San Fernando Valley districts.

Soil classifications are shown using the U. S. Bureau of Soil Classification data, data from tests of soils in place and laboratory tests. According to the annual report of Thomas Brooks, engineer in charge, corrosion experience data gleaned from studies of pipe failures give valuable indication of the accuracy of the different test methods used.

About 1,000 earth resistivity tests and 224 A.G.A. nipple and can tests were made last year. Limited areas of severely corrosive soil caused leaks in large steel mains in Western Ave. near Slauson Ave., and in Lankershinne Blvd. at Archwood Ave. Five special investigations of corrosion complaints on consumer premises indicated nothing for which the department was responsible.

Sewage Plant Power Generators Controlled Electrically

by A. C. KING
Consulting Engineer
and
F. N. LOCKWOOD
(Chicago, Ill.) Westinghouse Elec. & Mfg. Co.

Peoria (Ill.) disposal plant employs special devices for operating sludge gas engine interconnected with power company supply

IN MODERN DESIGN of sewage disposal plants, engineers have devoted considerable thought to operating economy and as a result the generation of electric energy as a by-product of the sludge treatment process has been promoted. In the production of such power, which is a variable quantity, it becomes necessary to obtain the cooperation of the local electric company in order to secure continuity of service and supply such power as is needed in excess of the energy available from the gas produced at any time. This involves the use of special relays and automatic protective equipment for trying the two systems together.

Where the supply of gas is relatively small, induction generators are employed on account of low cost and the simplicity of control and switching equipment. The generator feeds the power back into the electric company lines and the plant is equipped with meters so that the customer is billed on the net amount of electricity supplied by the power company. This relieves the power company of supplying increased capacity at the power plant.

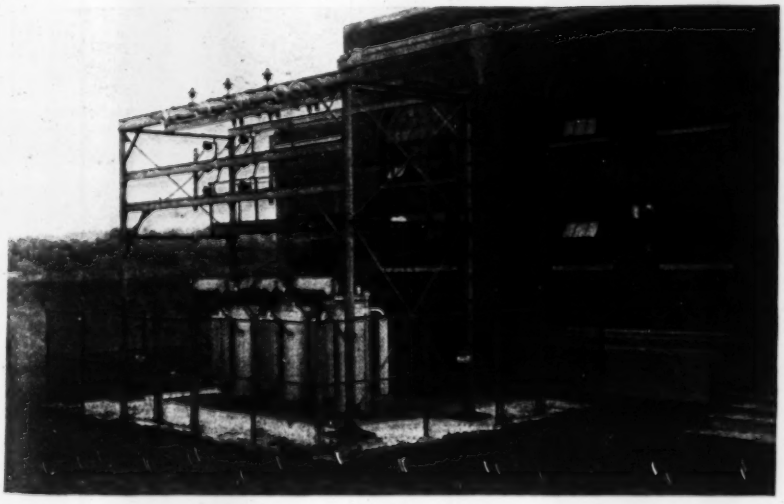

Fig. 1. Engine and generator set at the Peoria disposal plant operated by by-product sewage gas.

The gas obtained from sewage sludge averages above one cubic foot per day per capita served. Tests made on an installation utilizing this gas in engines for driving large blowers and generators shows a recovery of 80 per cent of the initial heat and energy in the gas or above 400 to 550 B.t.u. per cubic foot.

Plant and company tie-in

A recent example of electric company tie-in with a sewage treatment plant generating station is that at the Greater Peoria (Ill.) Sanitary District. The disposal plant in Peoria is located adjacent to an industrial concern producing solvents similar to alcohol. Since this concern has not found it economical to use the ordinary by-product recovery methods employed by distilleries, much organic waste is discharged into the municipal sewers. It has been found that much more gas is obtained from digestion of these wastes than from an equivalent amount of normal sewage. This accounts for a large gas production from this plant only a portion of which could be utilized for plant heating, etc.

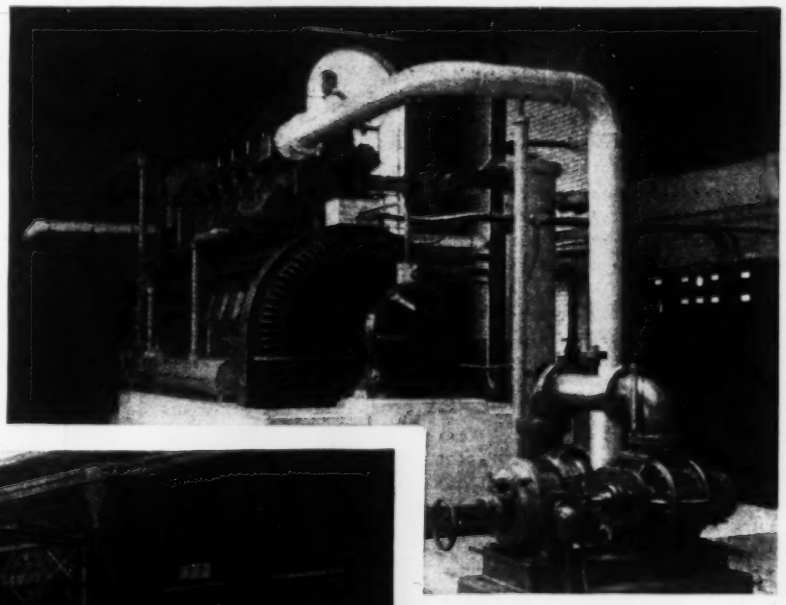

Fig. 2. Substation at the sewage treatment plant where interconnection is made with the power company supply.

In order to fully utilize the available gas, a gas engine of 550 hp. is

direct-connected to a blower with capacity of 15,000 cu.ft. of air at eight pounds pressure; this is utilized in furnishing air for aeration process, and the unit operates at variable speed as determined by air requirements. There is also installed a 300 hp. 400 r.p.m. gas engine direct-connected to a 230 kva., 2,400 volt, 3 phase, 60 cycle generator with direct-connected exciter. To use the energy generated by this unit to best advantage it was advisable to operate it on the station bus in parallel with purchased supply.

It is obviously impractical to start the larger pump and blower motors (from 100 to 450 hp.) by the generator, and the existing switchboard and bus layout made a separate bus system impracticable. The existing design was, therefore, modified so as to tie the new gas engine-driven generator and power-company system into a complementary source of power supply. For the control of the generator a separate cubicle is provided on main floor adjacent to the generator but all the high tension equipment is located on a bus structure back of the main switchboard on a balcony.

The gas engines do not have constant attendance so that automatic shut down devices have been provided for each machine consisting of contact controls which functions in case of high oil temperatures, low oil pressure, high circulating water temperature and failure of circulating water supply.

Overcurrent relays in the incoming power line as well as directional overcurrent relays are provided to open the line breaker if a fault occurs in the power company's feeder line. The feeder has an automatic reclosing breaker at the substation necessitating accurate timing of the breaker action at the sewage plant in order to insure proper resynchronizing of the two systems. A special relay also opens the line at the sewage plant end if the breaker at the power company's substation remains open thus insuring safety to any one working on the line. This is accomplished by measuring the value of the charging current of line and transformer connected thereto. The relay will not function to interfere with normal operation of the system. The generator breaker also is opened by directional overcurrent relays to provide against the generator operating as a motor with resultant waste of power.

Since the features outlined for protection are automatic functions, a twelve-drop annunciator has been provided to indicate the source of trouble so that the operator can immediately locate the original cause of failure. This annunciator indicates failure of either of the engine safety cutout devices, the main line breakers and the directional relays in the power company supply line and in the gas engine generator leads. An alarm is sounded when an annunciator drops open and if one of the safety devices on the engine operates the gas supply value is automatically closed and the ignition circuit is grounded to insure stopping the engine in minimum time while the engine not affected continues to operate.

The scheme of connections in the annunciator is such that when one drop opens none of the other drops will open until the initial trouble is cleared and the first drop is reset.

While this installation has been in operation only a few months, it has shown actual savings equal to the estimates and should pay for the entire cost within five years or less.

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Elevated Tank Improves Pressure In Montgomery, Ala., Water System

A ONE-MILLION GALLON elevated tank of radial girder design is a feature of the waterworks extension program for Montgomery, Ala., which is now nearing completion. The program involves an expenditure of $339,274, of which 55 per cent was financed by the city and 45 per cent received as an outright grant by the PWA.

The new type tank, which is one of the largest in the southeast, permits storage of 1,000,000 gallons with a maximum variation in depth of only 25 ft., while if one of the older standard types had been used a depth of at least 54 ft. would have been required. The shape of the bottom is such that all water in the tank helps to build up pressure in the entire distribution system. The tank is located at an elevation of 407 ft. above sea level.

The use of the tank has permitted the city to equalize water pressure in distribution mains throughout the entire city limits, and has doubled the pressure in the mains in the higher residential areas. This is expected to result in a reduction of fire insurance rates.

The new waterworks system includes seven artesian wells with a combined 24-hr. capacity of 1,000,000 gallons. Old wells with air-lift pumping equipment are being abandoned except for stand-by service. The new wells, equipped with modern electric pumps, can be operated at an estimated saving of $7,500 per year. The system improvements also include 14 mi. of cast iron water mains to provide distribution facilities for an increase of 12,000 customers.

F. N. Billingsley Engineering Co. were consulting engineers on the project. R. S. Garrett is the city engineer in charge.

Water storage of one million gallons is provided by this new elevated tank of radial girder design

BOOK NOTES AND REVIEWS

The month's additions to the engineer's reading and reference list

New Frame Design Theory

DIE METHOD DER CRUNDKOORDINATEN—By G. Kruck. 84 pp. Published by A. G. Gebr. Leeman & Co., Zurich, Switzerland. Price 7.20 Fr.

This book gives a partly new theory on frame design as well as a more general application of the delfection theory as applied to arches, trusses with bent members, and frames where the members do not meet at right angles. Joint movements in all directions are considered in the presentation. Many problems are completely solved—*Reviewed by* ODD ALBERT, *East Orange, N. J.*

Estimator's Guide

THE BUILDING ESTIMATOR'S REFERENCE BOOK and THE VEST POCKET ESTIMATOR—By Frank R. Walker. 1,682 and 220 pp., respectively. Published by the Frank R. Walker Co., Chicago, Ill. Price $10.

Extensive revisions have been made in this handbook for building estimators as a result of developments in the six years since the last edition was published. New information includes such matters as placing concrete by pumping, air conditioning, and the use of acoustical tile, all subjects that have developed rapidly in the past few years. The book, which is too large for pocket use, is accompanied by a little "Vest Pocket Estimator" giving pertinent data that is helpful in the field.

Engineer's Records

WHO'S WHO IN ENGINEERING—1937—Edited by Winfield Scott Downs. 1638 pp. Published by the Lewis Historical Publishing Co., Inc., New York. Price $10.

After a lapse of six years this biographical record of the engineering profession appears in a considerably enlarged form. (12,000 names) as compared with the 1931 edition, but not yet back to the 1925 figure of 18,000. As in the case of the 1931 edition, this one was prepared under the supervision of a committee named by American Engineering Council. Questionnaires were sent to the 176,000 men listed by the U. S. Dept. of Labor in its census of engineers, hence the coverage was about as complete as could be expected. Nevertheless there are notable omissions from the book of names that should be in such a record. Among them are John F. Stevens, Charles D. Marx and Edward M. Markham. A valuable addition to the present volume is a listing of national and local engineering societies with their secretaries.

Structural Analysis

STATISTICALLY INDETERMINATE STRUCTURES—By Fred L. Plummer. 95 pp. Published by Edwards Brothers, Inc., Ann Arbor, Mich.

A special feature of this book is conciseness. The reviewer knows of no treatise on the subject in which more ground is covered in the same space. At the same time there is no lack of thoroughness in treatment. The student who has mastered its contents has a broad working knowledge of the subject and a substantial background for further study.

The chapters are entitled respectively: Introduction; Deflections; Redundant Structures; and Special Methods. The latter chapter is subdivided into: three-moment equation; fixed and conjugate-point method; slope-deflection method; moment-distribution method; method of restraining stiffness; column analogy; and model analysis. The tables of Walter Ruppel, so useful in the design of haunched beams, are given in an appendix.

Each chapter is summarized. Numerous solved examples are given, also problems are proposed to which answers are not given. For the private student this is unfortunate. What the author calls "the principle of consistent elastic distortions" is adopted as the basic philosophy in the methods developed.

Space limitation will allow special reference to but two or three points. The deflection of beams due to bending is found by the "Maxwell-Mohr" method (known also as the Frankel method, the method of work, and the dummy-load method); by "moment-area analysis" and by "elastic weight analysis." The reviewer, being of a former generation, misses the classic method of Euler, the method of double integration. The deflection due to shear and that due to torsion are also considered. In the "fixed and conjugate point method," in chapter IV, use is made of the "characteristic points" of Fidler, so seldom even mentioned in American textbooks.

Although written primarily for the class room, the book can be studied with profit by those who have long been away from college halls. The reviewer can testify to his keen interest in it—*Reviewed by* ROBINS FLEMING, *American Bridge Co., New York.*

New Knowledge of Flow

APPLIED FLUID MECHANICS—By Morrough P. O'Brien and George H. Hickox. 360 pp. Published by McGraw-Hill Book Company, New York and London. Price $3.50.

Recent developments in fluid flow knowledge, wherein the theory of flow of all fluids is a single study, instead of many separate studies under specialized headings, have introduced many new possibilities and approaches to the various fluid problems. This book gives the reader the fundamental principles of these new developments and then illustrates their practical application. The authors, one with wide experience in laboratory experimentation and technical research and the other a practicing hydraulic engineer, use their experience in this field to good advantage and present the application of this comparatively new science in a concise, complete, and coherent manner.

After the usual treatment of hydrostatics, a general background is established for the reader by an ordinary-language description of turbulence, surging, cavitation and other flow phenomena. A complete elementary derivation of the equations describing the motion of a frictionless fluid—an essential background—prepares one for his introduction to those new attributes of the friction fluid,

namely, viscosity and the use of various criteria to compare fluid phenomena.

Practical applications of fluid mechanics principles to weir, orifice, gate, pipeline, meter, and open channel problems are discussed at length and consume more than one-half of the book. Mastery of fundamental principles is stressed throughout, however, for the details of particular applications are readily available in selected references conveniently listed at the end of each chapter.

An unusual but desirable feature is the chapter devoted to the principles involved in studying open channel flow by geometrically similar and distorted models, and should be of great interest to many civil engineers.

Engineers particularly interested in gaining a working knowledge of the basic principles necessary for the complete understanding of those many problems involving the flow of a fluid—gaseous, compressible, or otherwise—will find this book an invaluable aid. Solving its some 170 problems (many with answers) involves the use of its three appendices and not only illustrates the application of fluid mechanics principles to practical problems but acquaints one with the actual use of many new concepts such as Reynolds number, and Froude's law—*Reviewed by* H. P. Evans, Jr., *Urbana, Ill.*

Paving Specifications

STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION—150 pp. looseleaf. Published by American Public Works Association, Chicago. Price $3, binder $1.

The present edition of 22 specifications relating to the field of street paving is a revision and assembly of specifications of the American Society of Municipal Engineers and the International Association of Public Works Officials now fully merged into the A.P.W.A. Nine specifications deal with foundations, two with sidewalks, one with brick pavements, one with stone block pavements and nine with bituminous pavements. Specifications for concrete pavements and sewer construction are being revised. The foreword cautions users that these specifications are not intended to be incorporated bodily in any set of contract documents but the engineer should use them as guides or models and give full consideration to local conditions. Used as guides no essential item will be overlooked and materials and construction methods specified will conform to good practise.

MISCELLANEOUS NOTES ON BOOKLETS AND REPRINTS

Tax Map Construction and Use is the subject of a report issued by the Association of Assessing Officers, 850 East 58th St., Chicago, Ill. Copies are 50c. each.

Stresses and Deflections in loaded rectangular plates on elastic foundations, a paper by Glenn Murphy, has been published by the Iowa Engineering Experiment Station, Ames, Iowa, as Bulletin 135.

Pictures and Brief Descriptions of bridges in which slag concrete has been used are published in a pamphlet entitled "Bridges and Incidental Structures" being distributed by the National Slag Association, Earle Building, Washington, D. C.

A Directory of federal officials concerned with the regulation of utilities has been published by the Public Utilities Reports, Inc., Munsey Building, Washington, D. C., under the title of "Who's Who in the U. S. Government Utility Program." Price, $1.

Grades of Plywood made from Douglas fir and structural data for use in making concrete form panels of plywood are described in pamphlet XVI issued by the Douglas Fir Plywood Association of Tacoma, Wash. The pamphlet also illustrates wallboard types, gives stock panel sizes, and contains data on deflection of plywood when acting as a simple beam.

Suggested Symbols for plans, maps, and charts, a pamphlet prepared recently by the National Resources Committee, Interior Building, Washington, D. C., has been republished in a revised form. The pamphlet is based on the sheet of standard symbols prepared by the U. S. Geological Survey but adds many recommendations as to symbols and colors.

NEW PUBLICATIONS

HYDRAULICS—A Text on Practical Fluid Mechanics. Fourth Edition. By R. L. Daugherty. 460 pp. Published by McGraw-Hill Book Co., New York and London. Price $3.50.

BOECKH'S MANUAL OF APPRAISALS—Third Edition. By E. H. Boeckh. 399 pp. Published by The Rough Notes Co., Inc., Indianapolis, Ind. Price $5.00.

THE COLORADO DELTA—By Godfrey Sykes. 193 pp. Published by the Carnegie Institution of Washington and the American Geographical Society of New York, New York, N. Y. Price $4.

FORTIFICATION—Fourth Edition. By Col. William A. Mitchell, 216 pp. Published by The Society of American Military Engineers, Mills Building, Washington, D. C. Price $2.00.

CIVIL ENGINEERING—A Textbook for a Short Course. By Col. William A. Mitchell. 771 pp. Published by The Society of American Military Engineers, Mills Building, Washington, D. C. Price $5.

EVERYDAY SCIENCE—By A. W. Haslett. 305 pp. Published by Alfred A. Knopf, Inc., New York. Price $2.75.

THE RAILWAY INTERRELATIONS OF THE UNITED STATES AND CANADA—By William J. Wilgus. 304 pp. Published by the Yale University Press, New Haven, Conn., and the Ryerson Press, Toronto. Price $3.

AUSTRALASIAN ROADS—Fifth Edition. By the late J. M. and H. E. Coane and J. M Coane, Jr. Revised and enlarged by B. M. Coutie, assisted by W. G. McCowan. 811 pp. Published by Robertson & Mullens, Ltd., 107-113 Elizabeth St., Melbourne, Australia. Price 36/ net.

ELEMENTARY DESIGN OF STRUCTURAL STEEL AND REINFORCED CONCRETE—By Charles Kandall. 113 pp. Published by the Federation of Architects, Engineers, Chemists and Technicians, 114 E. 16th St., New York. Price $2.

ROAD CURVES — By F. G. Royal-Dawson. 246 pp. Published by E. & F. N. Spon, Ltd., London; obtainable from the Chemical Publishing Co. of New York, Inc. Price 3.50.

ESSENTIALS OF ENGINEERING ASTRONOMY—By Jerry H. Service. 167 pp. Published by Prentice-Hill, Inc., New York. Price $2.50

THE PORT OF BOSTON MASSACHUSETTS—PORT SERIES NO. 2 (Revised 1936)—Prepared by the Board of Engineers for Rivers and Harbors and the U. S. Shipping Board Bureau. 262 pp. For sale by the Superintendent of Documents, Washington, D. C. Price 30¢.

THE WEEK'S EVENTS

Continued from page 535

Ask Return of Road Work To Highway Commission

A suit seeking to return control of highway construction in Connecticut, now in the hands of the state public works department, to the state highway commission, is being entered by the Connecticut Rural Roads Improvement Association.

The 1937 general assembly passed a reorganization bill which turned the road building work over to the public works commissioner. Under the new arrangement the state highway department engineers still plan highway construction, but these plans are then turned over to the public works department for approval, award of contracts and supervision of construction.

In the court suit the association will set forth that the state highway commissioner is required under the law to construct and supervise the highways. It will be claimed that attorney-general Daly was in error when he interpreted the new reorganization law to mean that the commissioner of public works should be given charge of the work.

The public works act on which the attorney-general based his ruling gives the commissioner of public works supervision of the real assets of the state. The term was held to include highways. The court action to be started this month will hold that state-aid roads, although they may be real assets, are not the property of the state but of the town. When a road is built, it is claimed, the highway commissioner takes over the town roads and builds and assumes control of the highway, but the land still belongs to the town. Under the public works act, it is claimed, towns cannot now be sure whether commitments made in the past will be carried out on state-aid projects.

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Appeals Committee Named For California Buildings

Revised regulations of the Division of Architecture, State Department of Public Works of California (*ENR*, Aug. 12, 1937, p. 283), in accordance with the so-called Field Act regulating construction of school buildings, provide for an advisory board to which appeals may be made when there is disagreement with rulings of the Division.

The personnel of this board has recently been announced by Director of Public Works Erle Lee Kelly, as follows: Will G. Corlett, architect, Oakland, chairman; Walter Steilberg, architect, Berkeley; Walter L. Huber, structural engineer, San Francisco; L. H. Nishkian, structural engineer, San Francisco; Myron Hunt, architect, Los Angeles; Roy C. Mitchell, architect, Los Angeles; R. R. Martel, structural engineer, Pasadena; David H. Merrill, structural engineer, Los Angeles, and three ex-officio members as provided by the regulations, Geo. B. McDougall, state architect; Clarence H. Kromer, principal structural engineer, division of architecture and Dr. Bursch, chief of state division of school house planning.

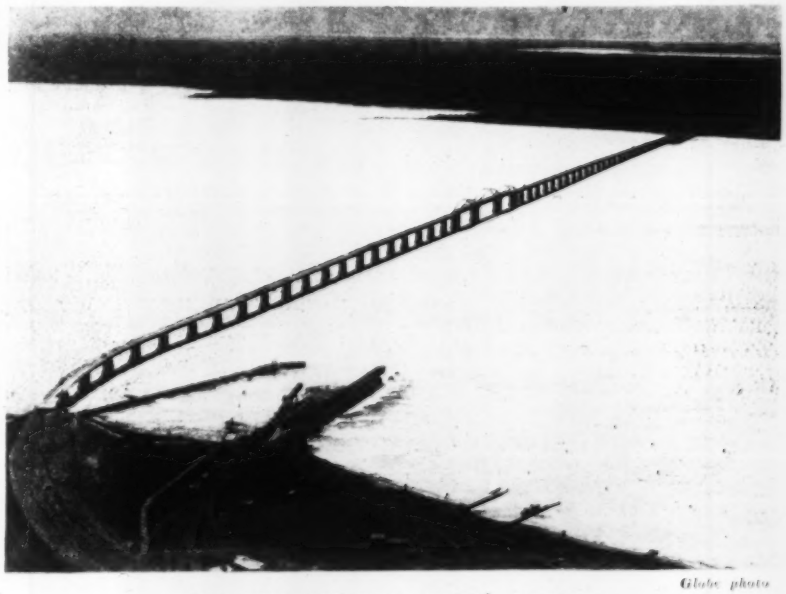
At the organization meeting of the board, David H. Merrill was elected secretary.

Housing To Be Discussed At Health Meeting

A symposium on "The Hygiene of Housing" will be presented before the American Public Health Association during its meeting in New York City Oct. 5-8 by the association's committee on the hygiene of housing. The committee has as its object the formulation of minimum standards of planning and construction for low cost housing. The symposium will be held Oct. 8.

Papers to be presented at the symposium by members of the committee include: Housing and Health, by R. H. Britten; Construction Methods, by R. L. Davison; Sanitary Engineering, by H. A. Whitaker; Town Planning, by Prof. James Ford; Safety in the Home, by M. G. Lloyd; Lighting, by James E. Ives; and Air Conditioning, by Professor C. E. A. Winslow, chairman of the committee. Discussion will be led by health officers from various sections of the country.

The symposium will be held at 9:30 in the North ballroom of the New Yorker Hotel and will be open to all those with a professional interest in housing.



Globe photo

TWO MILE BRIDGE IS EUROPE'S LONGEST

THE Storstrom bridge across the Storstrommen from the Danish Island of Zeeland to Falster (*ENR*, Aug. 6, 1936, p. 206), is being officially opened this month. Two miles in length, it is the longest bridge in Europe.

The bridge's 50 spans carry an 18½-ft. roadway, an 8-ft. sidewalk and a single track railway, rising to a height of 85 ft. above the water at the three navigation spans. These navigation spans are stiffened tied arches, 340, 450 and 340 ft. in length. The approach spans are of the cantilever type with suspended spans and anchor arms located in alternate openings. These spans are alternately 190 and 204 ft. long, consisting of two 12-ft. plate girders set 24 ft. apart.

The bridge was fabricated and erected and steel was furnished by Dorman Long & Co., Middleborough, England, for the Danish government at a cost of about $6,000,000.

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

AMERICAN PUBLIC WORKS ASSOCIATION, annual conference, Atlanta, October 4-6.

AMERICAN PUBLIC HEALTH ASSOCIATION, annual meeting, New York, Oct. 5-8.

AMERICAN SOCIETY OF CIVIL ENGINEERS, fall meeting, Boston, Oct. 6-8.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS, annual convention, New York City, Oct. 8-9.

NATIONAL COUNCIL OF STATE BOARDS OF ENGINEERING EXAMINERS, annual meeting, Scranton, Pa., Oct. 11-13.

NATIONAL SAFETY CONGRESS, Kansas City, Oct. 11-15.

NATIONAL RECLAMATION ASSOCIATION: annual meeting, Casper, Wyo., Oct. 12-14.

AMERICAN MUNICIPAL ASSOCIATION, annual meeting, Chicago, Oct. 13-15.

AMERICAN WELDING SOCIETY, annual meeting and exposition, Atlantic City, N. J., Oct. 18-22.

CANADIAN INSTITUTE OF SEWAGE AND SANITATION, annual convention, London, Ont., Oct. 21-22.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, annual convention, White Sulphur Springs, W. Va., Oct. 27-29.

HIGHWAY RESEARCH BOARD, annual meeting, Washington, D. C., Dec. 1-3.

THE ASPHALT INSTITUTE, national asphalt conference, Memphis, Dec. 6-13.

ASSOCIATION OF ASPHALT PAVING TECHNOLOGISTS, annual meeting, Memphis, Dec. 6-11.

UNIVERSITY OF KENTUCKY, road and street school, Lexington, Ky., Dec. 6-9.

REGIONAL AND LOCAL

SECTION MEETINGS, AMERICAN WATER WORKS ASSOCIATION: New York, Schenectady, Sept. 30-Oct. 1; Minnesota, St. Paul, Oct. 7-9; New Jersey, Atlantic City, Oct. 15-16; Southwest, Austin, Tex., Oct. 18-21; California, Sacramento, Oct. 20-23; Virginia, Richmond, Nov. 4-6; Missouri Valley, Omaha, Nebr., Nov. 4-6; Wisconsin, Green Bay, Nov. 8-10.

SOUTH DAKOTA WATER AND SEWAGE WORKS CONFERENCE, annual meeting, Sioux Falls, S. D., Oct. 11-12.

TEXAS PUBLIC HEALTH ASSOCIATION, annual meeting, Dallas, Nov. 1-3.

License examinations

NEW YORK: Examinations for professional engineering Jan. 24-26, and for land surveying Jan. 27, at Albany, Buffalo, New York and Syracuse. Applications for the January examinations must be filed before Nov. 1.

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Scholarships Awarded In Traffic Study

Fifteen fellowships providing a year's graduate study of traffic and highway subjects have been awarded by the Bureau for Street Traffic Research of Harvard University. Each fellow will receive $1,200 and in addition $200 for travel and field investigation.

Those who received the awards were: John F. Curtin, New York City; Ralph W. Dudley, New York City; William E. Egan, Hartford; Howard M. A. Baker, Montreal; Daniel J. Faustman, Sacramento; Dan M. Finch, Glendale, Calif.; De Hunter Harrold, Olympia, Wash.; Lawrence E. Hendrickson, Pocato, Minn.; Charles T. McGavin, Los Angeles; Thomas M. C. Martin, Olympia; John B. Masseh, Chicago; Harold W. Merryman, Salem, Ore.; Paul L. Ristroph, New Orleans; Robert F. Royster, Lafayette University; and Robert O. Swain of Austin, Texas.

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Channel to New York Fair

The Secretary of War has announced the allocation of $505,000 to provide a waterway through Flushing Bay from the East River to the site of the 1939 New York World's Fair. The project was approved by Congress in the Rivers and Harbors Act, but the money was not appropriated until passage of the final deficiency measure late in the last session.

The channel will be 12 ft. deep, and the same depth will be provided in a branch channel through a turning area, while a proposed municipal boat basin will be 8 ft. deep.

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County Reorganization Urged in Los Angeles

The Los Angeles, Calif., Board of Public Works has approved a resolution proposing that steps be taken to separate the city of Los Angeles from the present county and establish a combined city and county government. The resolution declares that under the present form of government the city is penalized in the distribution of tax money and benefits.

New England Governors Confer on Compacts

At a preliminary meeting of the governors of Maine, Connecticut, and Vermont and a representative of the governor of Massachusetts called informally on the occasion of their attendance at the Eastern States Exposition in Springfield, Mass., plans were made for a conference of the governors, to be held at a later date, to draw up plans for reaching a definite understanding with the federal government regarding flood control measures in the Connecticut and Merrimack Valleys now held up by disagreements on control of power.

Governor Cross of Connecticut will be chairman of the coming meeting and Governor Murphy of New Hampshire will be secretary. Controversy has arisen between the federal government and the state in connection with power rights on the Connecticut and Merrimack Rivers, where a cooperative flood control program financed by the federal government and by the states acting through an interstate compact was to have been undertaken under the Flood Control Act of 1936.

Earlier, on Sept. 15, Governor Aiken of Vermont, speaking at the Governors Conference in Atlantic City, expressed determined opposition to the federal position in the controversy. The resolution introduced in Congress last August which authorized the interstate compact only on condition that all reservoir power and storage sites be held by the federal government, he said, threatened the existence of the state. "The paramount question involved in the Connecticut interstate compact, is . . . one affecting the very foundations of our government," he said.

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Tax on Air Conditioning Planned in Cincinnati

Col. C. O. Sherrill, city manager of Cincinnati, is considering the possibility of recommending to the city council that air conditioning plants be taxed to finance enlargement of the city's sewerage system, it was announced recently.

Colonel Sherill said that a number of large establishments in the city used a water cooling system for air conditioning and that the discharge of this water was threatening seriously to overtax sewers in the basin section of the city.

Columbus, Ohio, and other cities already have an ordinance providing a fee payment for air conditioning installations.

Austin Co. photo

MODERN LINES FOR NEW WAREHOUSE

Modern functional lines are brought into warehouse construction in this new warehouse of the Saalfield Publishing Co. at Akron. Except for part of the third floor, which is devoted to editorial and business offices, the building will be used for the storage of books.

The structure has four stories and a basement with a total of 134,000 sq.ft. and is designed to permit the addition of three additional stories, extensions of the columns having been carried up to the roof, to facilitate expansion. An overhead bridge connects the warehouse section to the press building and bindery where production of Saalfield publications is concentrated.

Unusual features of the reinforced concrete brick structure include setback columns which permit introduction of continuous horizontal runs of sash. The floor slabs extend beyond the columns to the building exterior and form decorative bands above the windows at each level. The outer walls are supported on the floor slabs.

The building was designed and built for the Saalfield Co. by T. Austin Co.

OBITUARY

Walter I. Sweet, a retired engineer of the Manhattan division of the New York Public Service Commission, died Sept. 16 in St. Petersburg, Fla. at the age of 72.

Joseph E. Austin, for 31 years building inspector of New Haven, Conn., died Sept. 19 at the age of 79. Mr. Austin was for many years associated with the contracting firm of David L. Clark & Co.

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Damage Is Claimed From St. Lawrence Project

A claim for damages estimated at $100,000 against the Beauharnois Light, Heat & Power Co. has been entered before the Quebec Public Service Commission by Langevin Freres, Ltd., of Coteau du Lac, Que., for alleged losses in the operation of the company's water power mill arising from the construction of the Beauharnois power scheme. It is alleged that the Beauharnois project has had the effect of so lowering the level of the St. Lawrence River at the junction with it of the Delisle River that the operation of the applicant's mill has been severely restricted.

The commission has granted a delay for an amendment of the original claim and for the preparation of a reply by the Beauharnois Company.

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Pasadena Conference Plans Water Conservation

Efforts toward conservation of the water supply in the Pasadena basin have been instituted by the city of Pasadena, Calif. The city on Sept. 8 called together representatives of twenty-five cities, water companies, and individuals who draw on the Pasadena basin for water, for discussion.

Samuel B. Morris, water consultant, was the spokesman for the city. Mr. Morris, former head of the Pasadena Municipal Water Department, said that it will be necessary to reduce the annual draft in the basin 33 1/3 per cent if the basin is to continue to be of permanent value. Pasadena proposes to bring a friendly suit to adjudicate water appropriations.

PERSONAL

James B. True has resigned his position as state highway engineer of Wyoming.

W. W. Sanders, WPA area supervisor for the past two years for several Mississippi counties, has resigned to accept the position of county engineer of Pearl River County, Miss.

David S. Courtright has resigned the position which he has held for the last two years as city engineer of Circleville, Ohio. He will resume his private practice at Circleville.

C. F. Siefried has been appointed state highway engineer of Wyoming, succeeding James B. True. Mr. Siefried has been connected with the department since 1919 and recently has held the position of office engineer.

Henry A. Stoess, Jr., formerly shop dispatcher for Joseph T. Ryerson & Son, Inc., of Jersey City, is now employed by the Bethlehem Steel Co. in the fabricated structural steel department.

Bruce D. Greenshields has resigned as professor of engineering science at Denison University to accept a position as associate professor of civil engineering at the City College of New York.

J. Hugo Johnson has been named acting dean of the College of Engineering of the University of Idaho, succeeding Ivan C. Crawford. Professor Johnson, head of the electrical engineering department, has been on the faculty since 1918 and was acting dean in 1933–34.

Paul V. Hodges, formerly engineer in the U. S. Indian Service at Billings, Mont., is now hydrographic engineer for the U. S. Indian Irrigation Service. At present he is investigating irrigation conditions in connection with a report on the Indian pueblos in New Mexico dealing with water supply and stream flow diversion.

F. DeWitt Odell, connected for 20 years with the New York state division of highways at Syracuse, Albany, Rochester, and lately at Watertown, has been appointed county superintendent of highways of Oswego County, New York. Mr. Odell was for some years connected with the engineering firm of Ford, Bacon & Davis, New York City, as assistant engineer on the construction of street railroads, steam power plants and industrials in New York, Pennsylvania and Virginia.

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

NEW YORK STATE HIGHWAYS

OWNER: New York State Dept. Public Works, Albany, N. Y.

PROJECT: Construction of miscellaneous highway projects: (1) 6.26 miles in Broome County of type M. M. 4, bituminous macadam; (2) 2.84 miles in Yates County of type T, heavy bitumen; (3) 0.87 miles in Orange County of type M. M. 4, bituminous macadam; (4) 7.92 miles in Dutchess County of cement concrete paving; (5) 17.56 miles in St. Lawrence County of type M. M. optional, bituminous macadam.

BIDS: Opened June, 1937: eight on the Broome County project, ranging from $333,821 to $389,696: nine on the Yates County project, ranging from $49,350 to $62,151: five on the Orange County project, ranging from $86,821 to $95,918: eight on the Dutchess County project, ranging from $360,944 to $418,486: and nine on the St. Lawrence project ranging from $332,289 to $394,650. Minimum hourly wages are stipulated of 75c. for skilled and 45c. for common labor.

LOW BIDDERS:

I. Broome County—S. H. 1486 & 8020.
1. J. F. Morgan Co., Ithaca, N. Y. $333,821
2. C. D. Murray Co., Syracuse, N. Y. 333,999
3. Ellis G. De Lia & Co., New Hartford, N. Y. .. 338,177

II. Yates County—Bath Rd.
1. Ontario Sand & Gravel Co., Geneva, N. Y. .. $49,350
2. John Petrossi Sons, Inc., Rochester, N. Y. .. 50,766
3. Hornell Construction Co., Hornell, N. Y. 51,749

III. Orange County—S. H. 5480.
1. Bronx Water Works Corp., Bronx, N. Y. $86,821
2. Thomas A. Brogan, Yonkers, N. Y. 87,861
3. Gould & Kress, Inc., New York, N. Y. 89,243

IV. Dutchess County—S. H. 8507.
1. John Arborio, Poughkeepsie, N. Y. $360,944
2. Collins Bros., Mechanicville, N. Y. 369,021
3. A. W. Banko, Inc., Hastings-on-Hudson, N. Y. 379,741

V. St. Lawrence County—Potsdam Village.
1. D. W. Winkleman Co., Syracuse, N. Y. $332,289
2. Rochester Vulcanite Paving Co., Rochester, N. Y. 342,564
3. Mid-State Builders, Inc., Utica, N. Y. 345,860

I — BROOME COUNTY

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear, grub	L.S.	$1,000.00	$1,100.00	$1,000.00
2. Excav., unclass	145,100 c. y.	.25	.25	.25
3. Trench, culv., br. exc	5,600 c. y.	.85	1.00	1.00
4. Overhaul	580,000 s. y.	.005	.005	.005
5. Trim shoulders	34,300 l. f. rd.	.20	.20	.20
6. Prepare fine grade	75,000 s. y.	.10	.20	.20
7. Pipe undrdr., opt., 6 in.	8,600 l. f.	.21	.20	.25
8. C. i. p., 16 in.	20 l. f.	2.50	2.50	2.50
9. C. i. or spec. r. c. pipe, 24 in.	1,860 l. f.	5.00	5.00	5.00
10. C. i. or spec. r. c. pipe, 36 in.	220 l. f.	11.00	10.00	11.00
11. C. i. or spec. r. c. pipe, 42 in.	76 l. f.	16.50	16.50	16.50
12. C. i. or spec. r. c. pipe, 48 in.	160 l. f.	20.00	20.00	20.00
13. C. i. or spec. r. c. pipe, 60 in.	108 l. f.	27.50	25.00	27.50
14. Portland cement	25,700 bbl.	2.30	2.60	2.30
15. Natural cement	2,130 bbl.	1.95	1.95	1.95
16. Conc. C. L. A. 1-2-4	265 c. y.	20.00	13.50	20.00
17. Met. reinf., conc. pavt.	74,000 s. y. p.	.25	.25	.25
18. Joint supports	7,700 ea.	.50	.50	.50
19. Misc. iron, steel	9,000 lb.	.10	.10	.10
20. Cable guard railing	20,300 l. f.	1.05	.95	1.00
21. Guide posts	340 ea.	3.50	2.50	3.50
22. Fd.c'se, r. of b. gravel	5,100 c. y.	1.50	.80	1.50
23. Cem. conc. pavt.	200 c. y.	5.50	5.50	5.00
24. Cem. conc. pavt.	9,565 c. y.	5.65	5.35	5.15
25. Cem. conc. pavt.	5,600 c. y.	5.65	5.35	5.15
26. Top course bit. mac. MM 4.	150 ton.	10.00	8.00	10.00
27. Maint. traffic, culverts	L.S.	300.00	300.00	300.00
28. Maintain traffic	60,200 L.F.	.10	.10	.10
29. Protect traffic	L.S.	1,000.00	1,100.00	1,000.00
30. Dry rip rap	8,850 c. y.	3.00	3.00	3.50
31. Screened gravel	3,100 c. y.	2.00	1.50	2.00
32. Conc. gutters	970 s. y.	2.50	2.50	2.50
33. Conc. R/W markers	180 ea.	4.00	2.00	4.00
35. Timber	1 M.f.b.m.	60.00	1.00	5.00

II—YATES COUNTY

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear, grub	L.S.	$300.00	$330.00	$300.00
2. Excav., unclass	30,000 c. y.	.46	.36	.47
3. Pipe undrdr., 6-in	1,000 l. f.	.65	.40	.40
4. Pipe culverts, 18-in	250 l. f.	3.10	2.50	3.35
5. Pipe culverts, 24-in	112 l. f.	5.00	4.50	5.70
6. Pipe culverts, 30-in	128 l. f.	7.50	9.00	9.00
7. Pipe culverts, 36-in	68 l. f.	9.00	12.00	8.00
8. Conc. struct., 1-2-3½	135 c. y.	19.30	25.00	25.00
9. Conc. cl. A., 1-2-4	18 c. y.	19.30	25.00	25.00
10. Conc. cl B., 1-2½-5	55 c. y.	19.30	20.00	16.00
11. Reinf. steel	10,000 lb.	.06	.06	.06
12. Guide posts	210 ea.	2.50	2.75	2.50
13. Fdn., stone or slag	8,100 c. y.	1.72	2.00	1.75
14. Top, bank gravel	2,135 c. y.	1.95	2.25	2.00
15. Bit. mat. T. heavy surf	45,590 gal.	.13	.13	.14
16. Bit. mat. T. hot app	9,100 gal.	.14	.14	.15
17. Maint. traffic, culverts	L.S.	200.00	275.00	250.00
18. Protect traffic	L.S.	300.00	550.00	500.00
19. Cobble gutter	340 s. y.	1.50	2.00	2.00
20. Conc. R/W markers	58 ea.	3.00	3.00	4.00
21. Timber	5 Mbm.	10.00	.01	60.00
22. Relay old pipe	100 l. f.	.75	.50	.75

III — ORANGE COUNTY

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear, grub	L.S.	$500.00	$550.00	$550.00
2. Excav., unclass	13,800 c. y.	.50	.48	.65
3. Excav., structures	1,260 c. y.	1.50	2.00	1.50
4. Trim shoulders	4,660 l. f. rd.	.10	.20	.20
5. Prepare fine grade	22,610 s. y.	.10	.10	.20
6. Sewer pipe, opt., 12 in	100 l. f.	.90	.90	.55
7. Pipe undrdr., opt., 6 in	1,000 l. f.	.35	.35	.12
8. C. I. or R. C. pipe, 18 in	260 l. f.	2.50	2.00	1.50
9. C. I. or R. C. pipe, 24 in	220 l. f.	4.25	4.00	2.60
10. C. I. or R. C. pipe, 30 in	130 l. f.	7.00	6.00	4.50
11. Portland cement	9,370 bbl.	2.40	2.30	2.00
12. Natural cement	465 bbl.	2.00	2.00	1.80
13. Concrete, cl. A	32 c. y.	20.00	20.00	18.00
14. Masonry, stone	125 c. y.	7.50	7.00	7.00
15. Mesh reinf	22,150 s. y.	.25	.24	.27
16. Bar reinf	1,800 lb.	.08	.08	.10
17. Joint supports	2,700 ea.	.50	.45	.50
18. Misc. iron, steel	10,500 lb.	.08	.08	.10
19. Rustic timber guide rail	4,100 l. f.	1.10	1.10	.95
20. Guide posts	10 ea.	2.50	2.50	2.50
21. Fdn., bank gravel	1,500 c. y.	1.25	1.25	1.10
22. Bot. c'se, broken stone	55 c. y.	6.00	5.00	4.20
23. Cem. conc. pavt	1,285 c. y.	5.15	5.40	5.50
24. Top c'se, bit. mac. MM 4	370 s. y.	1.50	1.10	1.25
25. Maint. traffic, culverts	l. s.	125.00	135.00	137.00
26. Maintain traffic	12,400 l. f.	.05	.10	.15
27. Protect traffic	l. s.	300.00	330.00	330.00
28. Screened gravel	260 c. y.	1.75	1.50	1.50
29. Broken stone, l. m., 4	275 c. y.	2.60	2.60	2.50
30. Conc. curbing, type E	130 l. f.	1.60	1.60	1.00
31. Cobble gutter	40 s. y.	1.60	1.60	1.00
32. Catch basins, manholes	7 ea.	50.00	50.00	60.00
33. Conc. R/W markers	35 ea.	2.00	4.00	2.00
34. Timber	5 m.b.m.	40.00	77.00	1.00
35. Relay old pipe	50 l. f.	.30	.40	.40

IV — DUTCHESS COUNTY

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear, grub	l. s.	$4,000.00	$4,000.00	$4,400.00
2. Excav., unclass	142,300 c. y.	.35	.35	.40
3. Excav., structures	2,200 c. y.	1.50	1.50	1.25
4. Overhaul	250,000 s. y.	.05	.05	.05
5. Trim shoulders	41,830 l. f.	.20	.20	.15
6. Prepare fine grade	93,510 s. y.	.20	.15	.12
7. Sewer pipe, opt., 12 in	200 l. f.	.50	.60	.70
8. Pipe undrdr., opt., 4 in	100 l. f.	.30	.25	.25
9. Pipe undrdr., opt., 6 in	1,000 l. f.	.35	.30	.30
10. C. I. or R. C. pipe, 18 in	1,350 l. f.	3.00	2.25	2.00
11. C. I. or R. C. pipe, 24 in	840 l. f.	5.00	3.25	3.00
12. C. I. or R. C. pipe, 30 in	230 l. f.	8.00	5.00	5.50
13. C. I. or R. C. pipe, 36 in	360 l. f.	11.00	8.00	7.00
14. Portland cement	33,750 bbl.	2.15	2.50	2.30
15. Natural cement	531 bbl.	1.90	2.05	2.00
16. Concrete, structures	135 c. y.	15.00	17.00	20.00
17. Concrete, cl. A	175 c. y.	15.00	17.00	17.00

(*Additional Contract Unit Prices on second following page*)